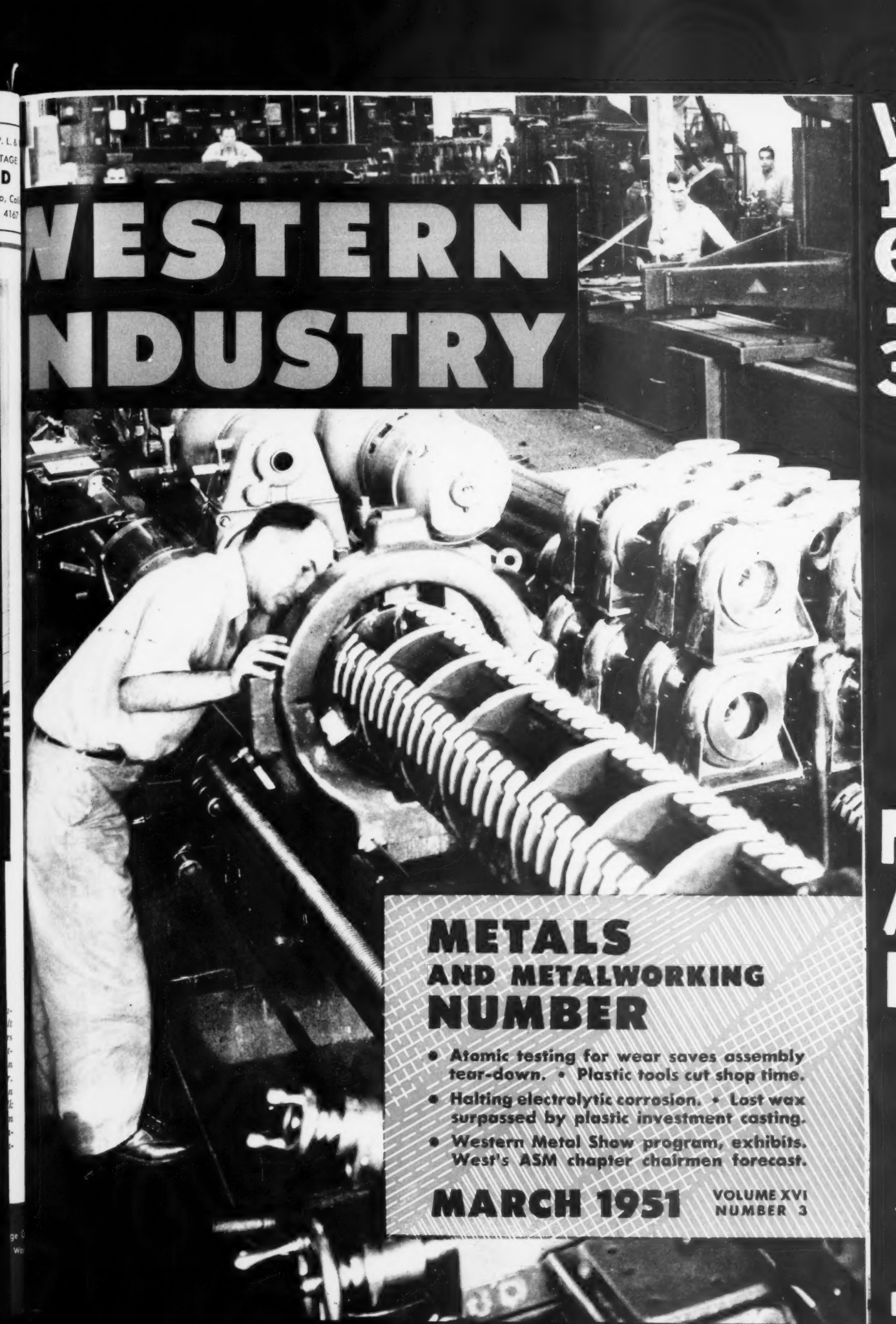

# WESTERN INDUSTRY

## METALS AND METALWORKING NUMBER

- Atomic testing for wear saves assembly tear-down. • Plastic tools cut shop time.
- Halting electrolytic corrosion. • Lost wax surpassed by plastic investment casting.
- Western Metal Show program, exhibits. West's ASM chapter chairmen forecast.

**MARCH 1951** VOLUME XVI NUMBER 3

# There's more to a Wirebound box than wood, wire and price!

Experience, adequate plant facilities and container know-how are essential to soundly engineered, dependable containers. Cabco has been making wooden containers since 1883. Facilities embrace everything from logging to the finished wirebound. Cabco is the West's recognized leader in designing, developing and supplying wooden shipping containers.

## New 20-lb. Cabco wirebound "cradles" 150-lb. rolls of Kaiser Aluminum foil

Kaiser Aluminum & Chemical Corporation said: "Nothing must touch the surface of these 150-lb. rolls of aluminum foil. They must have 100% protection during travel and storage." So Cabco designers engineered a new kind of wooden wirebound container. A pair of crossed-grain double end pieces suspend the core on which the rolls are wound. Then an extra-strong Douglas fir and wire wrap-around binds the whole into a compact, easily handled, and extremely rugged container. Kaiser officials say the new Cabco wirebounds occupy less storage space, assemble more quickly, and weigh 40% less than comparable nailed boxes. Container durability is such that the Cabco wirebounds are regularly returned to Kaiser for re-use.

*This is but one of the many new industrial applications for Cabco wirebounds. Perhaps Cabco containers can increase the economy and convenience of your shipping operation.*

CABCO
CONTAINERS

A product of the California Barrel Company, Ltd.

Sold only through

**DUFF CALIFORNIA CO.**

100 Bush Street, San Francisco 4, California
2581 E. Eighth Street, Los Angeles 23, California
501 Dooley Building, Salt Lake City 1, Utah

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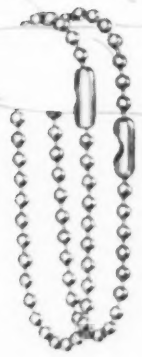
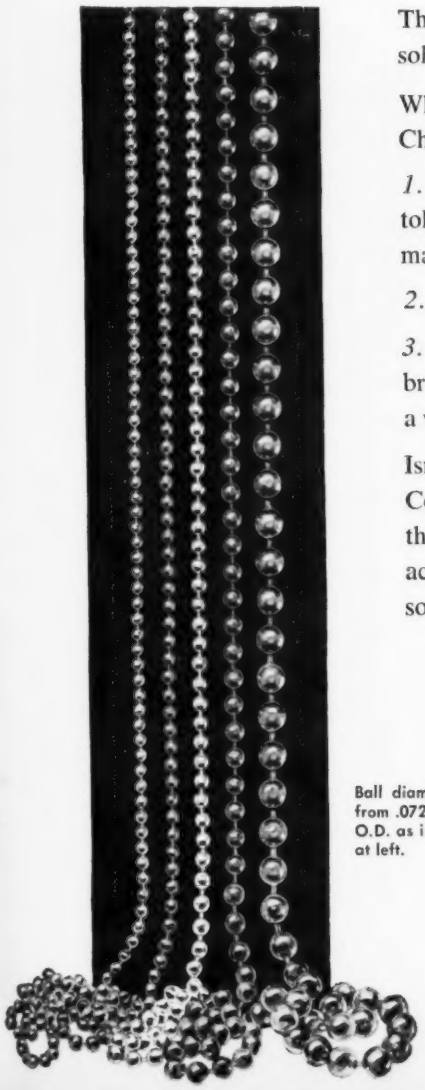
FOR SALE

# . . . two for a penny



Ball Chain has a wide variety of uses—from Armed Forces identification tags to sink stopper pulls.



Ball diameters vary from .072" to .187" O.D. as illustrated at left.

That, roughly, is the manufacturer's price in quantity for these solid brass key chains.

What makes it possible? These three factors, as outlined by the Ball Chain Manufacturing Co., Inc., of Mount Vernon, New York:

*1.* Ingenuity in the design of multiple dies of extremely close tolerances . . . and their adaptation to specially developed automatic equipment.

*2.* High production over long periods.

*3.* Uncompromising standards of quality in every mill shipment of brass, copper or nickel silver strip necessary for the fabrication of a wide variety of Ball Chains and attachments.

Isn't it significant that "Ball Chain" considers The American Brass Company its most dependable source of supply for metals made to the most exacting requirements; composition, anneal, flatness across the entire strip width, and uniform gage of metal which, in some instances, must be within .00025".

51101

ANACONDA

*the name to remember in*

**COPPER · BRASS · BRONZE**

# WHEREVER METAL TAKES A BEATING

. . . in manufacturing, in service, or both—
*no other* alloys possess the combination of
properties of Phosphor Bronze. And *nowhere* is
finer Phosphor Bronze produced than in
the mills of The American Brass Company—
in sheet, wire, rod and tube.

*Illustrated here are a few of the myriad of bellows and bellows devices made of Anaconda Phosphor Bronze and other Copper Alloys by The Bridgeport Thermostat Division of Robertshaw Fulton Controls Co., Bridgeport, Conn.*

ANACONDA

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Tensile strength
Elastic limit
Resistance to fatigue
Resistance to corrosion
Resistance to wear

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# WESTERN INDUSTRY

VOLUME XVI MARCH · 1951 NUMBER 3

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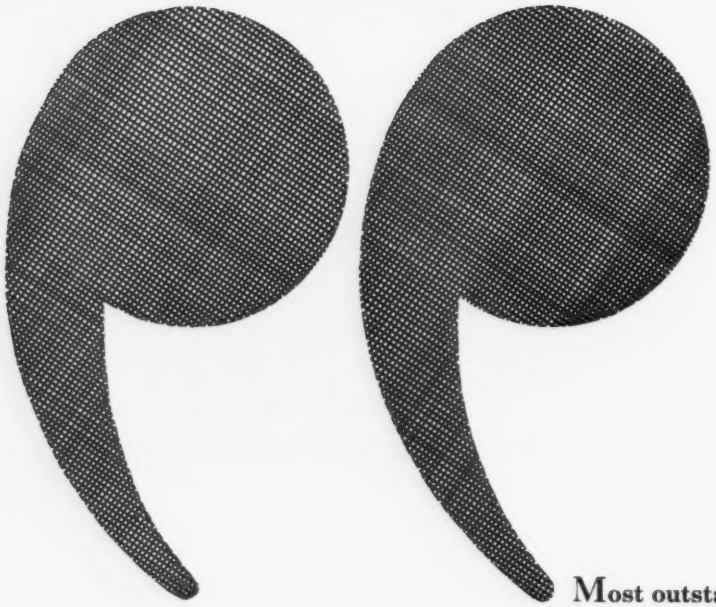
**Front Cover**

Metalworking precision is necessary—even in winery crushers, such as this being manufactured at Valley Foundry & Machine Works, Inc., Fresno, Calif.



**Most outstanding increase in steel-making capacity in the West (since World War II) has been that of the Kaiser Fontana plant . . .**

THAT quotation from *Iron Age*, authoritative journal of the steel industry, is confirmed by these facts:

Kaiser Steel has increased ingot production from 553,000 tons in 1944 to an estimated 1,380,000 tons for 1951—more than twice the production of the peak war year!

Equally important is the diversification which has taken place in the past nine years. Kaiser Steel now makes the following products which were not produced in the seven western states prior to World War II: Plates, continuous weld pipe, electric weld pipe, cold rolled strip and sheet, alloy bars, and certain sizes of structural shapes.

Today, when more steel is vitally needed, Kaiser Steel continues its program of further expansion.

This constant growth is another reason why the West Coast's only integrated *independent* steel plant is bringing more industry, more jobs, more wealth to the West!

***It's good business to do business with***

# Kaiser Steel

***built to serve the West***

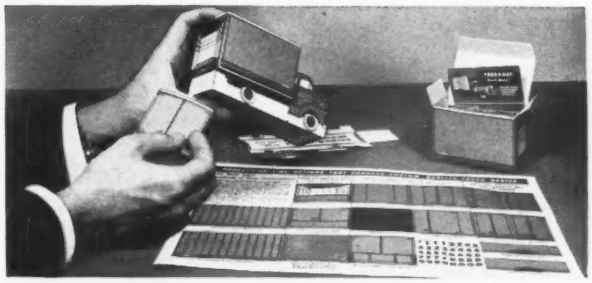
**PROMPT, DEPENDABLE DELIVERY AT COMPETITIVE PRICES** • plates • continuous weld pipe • electric weld pipe • hot rolled strip • hot rolled sheet • alloy bars • carbon bars • structural shapes • cold rolled strip • cold rolled sheet • special bar sections • semi-finished steels • pig iron • coke oven by-products

For details and specifications, write: **KAISER STEEL CORPORATION, LOS ANGELES, OAKLAND, SEATTLE, PORTLAND, HOUSTON, TULSA, NEW YORK**

# FRUEHAUF VAN BODIES are "Job-Fitted" to YOUR BUSINESS...OVER 500 WAYS!

BEFORE you consider any other Truck Body today, you owe it to yourself to investigate these "BIG 5" FRUEHAUF BUYING ADVANTAGES:

1. Over 500 options. 2. All steel, "Unit-Built" construction. 3. Straight-frame or wheelhousing . . . all popular lengths. 4. Fast assembling, mounting and painting service at 80 Branches coast-to-coast. 5. Custom-built quality at production-line prices.



## "JOB-FITTED" IN MINIATURE!

Fruehauf Truck Body Model Kit lets you make up your own unit—complete with all options—*before it's built!* A few seconds is all it takes. Ask for your model kit today—*free* to any prospect upon request.

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***Truck Bodies***
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BODY DIVISION
10949 HARPER AVE. • DETROIT 32, MICH.

# COMPARISON PROVES the VALUE of VEELOS

## the Adjustable V-Belt...

IF you use v-belts you'll be interested in this clear statement of facts about VEELOS, the link v-belt, and endless v-belts.

These 4 reels of Veelos provide up to 316 standard v-belt sizes

### COMPARISON TABLE
### VEELOS and ENDLESS V-BELTS

| what about... | Veelos V-Belts | Endless V-Belts |
|---|---|---|
| ADJUSTABILITY | *Any* length can be provided for *any* v-belt drive due to link construction. | Standard or special lengths must be supplied for *individual* drives. |
| INVENTORY | MINIMUM INVENTORY. 4 reels can care for every v-belt need in the O, A, B and C widths. No deterioration or obsolescence of spare belts. | LARGE INVENTORY. 316 sizes are required to provide a *complete* stock in the O, A, B and C widths. Spare belts not immediately used will age and deteriorate. |
| STOCKROOM STORAGE | SMALL SPACE. It takes less than 2 square feet of wall or floor space to store 4 reels of easily identified Veelos. | LARGE SPACE. Walls and ceilings are often covered with stocks of endless v-belts. Identifying and maintaining full stocks is difficult and costly. |
| INSTALLATION | Installs quickly *on any drive* without resetting motor or tearing down outboard bearings. | Necessary to reset motor and tear down drives with outboard bearings. |
| MAINTENANCE | Belts can be adjusted or replaced without moving the motor. | Sliding or pivoted motor bases are necessary to replace endless v-belts. Belts cannot be adjusted individually. |
| OPERATING EFFICIENCY | Full power delivery can be maintained because the tension of each belt in a matched set is kept uniform by removing or adding links. | Individual belts cannot be adjusted to maintain uniform tension and provide full power delivery. |
| DRIVE LAYOUT | No limitations are imposed by belt length. | Limited by the availability of standard or special belt lengths. |

If you would like to learn more about Veelos—how it can save you money and keep your machines producing—write today for your copy of the Veelos Data Book. It's free and full of facts!

**MANHEIM MANUFACTURING & BELTING COMPANY**
**MANHEIM, PENNSYLVANIA**

VEELOS
THE LINK
V-BELT

**... ADJUSTABLE TO ANY LENGTH ... ADAPTABLE TO ANY DRIVE**

Made in all widths in three types: regular, oil-proof and static conducting. Also double V in A and B. Packaged on reels in 100-foot lengths. Sales engineers in principal cities; over 350 distributors throughout the country. VEELOS is known as VEELINK outside the United States.

# O[illegible]ESPONSIBILITY...

- **to the planes in the air**
  **...to the machines of defense**
  to make each vital part so right that it will not fail under stress.
- **to our fighting forces**
  to supply essential precision parts in quantities needed, when needed.
- **to our Nation**
  to fuse all our skill, all our man-and-machine power, for maximum production at minimum cost.

★
EFFICIENTLY SERVING
SINCE 1929

ARMY-NAVY "E" AWARDED IN 1944

*Pacific Screw Products Corp.*

Largest and Best Equipped Screw Machine Plant in the West
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# piping repairs *cost more* now!

No. 488 Iron Body Clamp Gate

**You make them less often by using Dependable Quality**

## CRANE VALVES

*...That's why more Crane Valves are used than any other make*

**easy access prevents trouble with this valve**

Remove just two nuts to dismantle this gate valve for inspection, cleaning, or repairs—without taking it from the line. Reassemble just as easily, knowing that Crane clamp design keeps the bonnet joint snug and accurately aligned. Use Crane Clamp Gates on steam, water, and air, but especially in heavy fluid lines needing periodic cleanout. They'll save time, labor, and encourage regular servicing that prevents valve trouble.

**Combining easy access with highly dependable service features, Crane Clamp Gates typify Crane Quality—*better valve performance at lowest ultimate cost.***

# CRANE

CRANE CO., *General Offices:*
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*Branches and Wholesalers Serving All Industrial Areas*

**VALVES • FITTINGS • PIPE • PLUMBING • HEATING**

# STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol O.H.T. Grease

UNIT Automotive generator-bearing

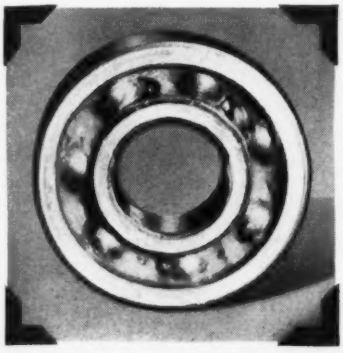
LUBRICATOR Sealed at installation

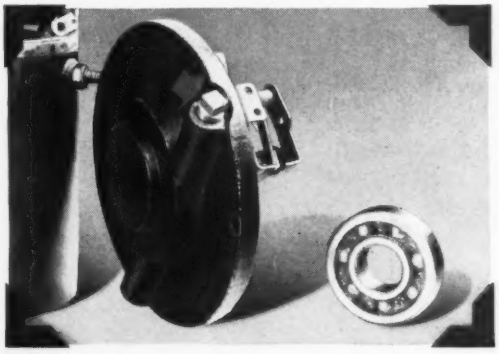
CONDITIONS Heavy-duty diesel truck engine

MILEAGE 70,000

FIRM H. G. Makelim Co., San Francisco–Oakland

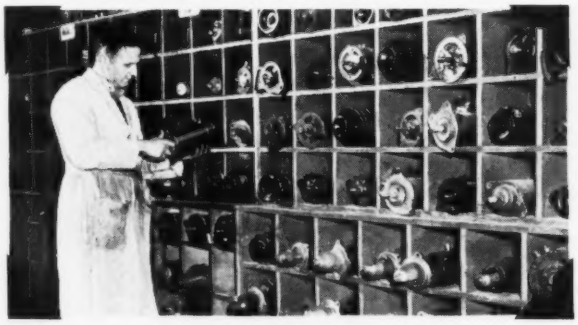
## Sealed generator bearing still perfect after 70,000 miles!





ONE APPLICATION OF CALOL O.H.T. GREASE, sealed in the bearings when this diesel-engine generator was assembled by H. G. Makelim Co., prevented any bearing wear in 70,000 miles of heavy-duty truck service. Generator was disassembled at this time only because it needed new brushes, and for general inspection. Note a permanent plug replaces usual grease fitting.

70,000 MILES OF SERVICE did not affect or use up any of the CALOL O.H.T. Grease in the bearings. In special tests, one filling has lubricated bus-generator bearings perfectly for more than 150,000 miles.

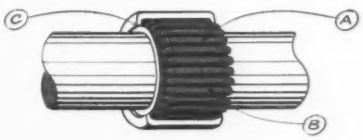


"WITH CALOL O.H.T. GREASE SEALED IN BEARINGS, we recommend installing generators without grease fittings," says Frank Balzarini, H. G. Makelim Co. Foreman. "CALOL O.H.T. eliminates need for greasing between overhauls. And eliminating fittings stops over-greasing—a big cause of wear and trouble."

REMARKS: The H. G. Makelim Magneto Repair Company, San Francisco and Oakland, one of the West's oldest automotive-electrical and carburetor repair firms, specializes in servicing equipment in the toughest automotive service—truck, bus and car fleets.

Besides generator bearings in this service, CALOL O.H.T. Grease is recommended for all types of bearings in service under extremely severe operating conditions.

### How CALOL O. H. T. Grease protects bearings in severest operating conditions




Used in any type of bearing under any operating condition, high temperature-low speed, high speeds to 10,000 rpm, temperatures from minus 10° F. to 400° F., CALOL O.H.T. Grease will last indefinitely.

A. Contains special oxidation inhibitor—prevents rusting, corrosion, hardening of grease at any time.

B. Resists high temperatures — eliminates coking.

C. Provides excellent seal against water... lubricates efficiently in slight moisture.

CALOL

STANDARD TECHNICAL SERVICE checked this product performance. If you have a lubrication or fuel problem your Standard Fuel and Lubricant Engineer or Representative will give expert help; or write Standard of California, 225 Bush St., San Francisco 20.

Trademark "CALOL" Reg. U. S. Pat. Off.

STANDARD OIL COMPANY OF CALIFORNIA

# Every Air Hose With This Trademark

# Assures Long Operating Life

Air hose economy is not measured in feet per dollar. The only true yardstick of air hose value is *service hours.*

Because every BWH hose has been developed, tested and field-proven to give the best possible combination of strength, safety, flexibility and damage resistance . . . *you get maximum service life.*

Whatever brand of hose you are now buying, you are paying for BWH benefits — so why not start getting them — *now?*

Today, contact your nearby BWH Distributor.

**CONCORD AIR**

An extra quality, exceptionally rugged hose for toughest use on air drill and pneumatic service in mines, quarries and construction jobs. Non-porous tube resists heat and oil. High tensile cotton yarn braid reinforce carcass. Tough grey cover resists cutting, gouging, abrasion. 7 sizes from ¼" 2-braid through 2" 3-braid. 200 to 300 lbs. working pressure. Maximum length 50'.

**BAY STATE AIR DRILL**

For heavy construction work in mines, quarries, tunnels and wherever large size hose is required for long service. Smooth black tube resists heat and oil. Carcass of strong, rubber-impregnated multiple ply woven duck. Rugged, heavy-gauge red rubber cover resists severe weather extremes, cutting, abrasion. 9 sizes stocked from ½" to 4". Working pressures from 175 to 225 lbs. Maximum length 50'.

**AUROCHS AIR**

For portable air compressors, jackhammers, rugged industrial and construction work. Smooth, black, non-porous tube resists heat and oil. Carcass: multiple ply, rubber-impregnated, rugged woven fabric. Tough black cover resists weather and abrasion. Stocked sizes: ½", ¾", 1". 200 lbs. working pressure. Maximum length 50'.

**TIGER AIR**

Lightweight, flexible hose for general industrial and medium air service. Smooth black tube resists oil and heat. Carcass is strong, lightweight multiple ply woven fabric. Tough, black cover resists abrasion. Stocked sizes: ⅜", ½", ¾". 150 lbs. working pressure. Maximum length 50'.

**VIM AIR**

For general industrial use, on compressors and pneumatic tools. Black tube resists oil and heat. Husky cotton yarn braids. Smooth, red cover resists weather, abrasion. 8 sizes stocked, ¼" 2-braid to 1" 3-braid. Working pressures 150 to 225 lbs. Maximum length 500'.

**BULL DOG VARI-PURPOSE AIR**

For a variety of jobs including handling of air, water, oil, gasoline, kerosene (not for paints, lacquers, lacquer-solvents). Black, synthetic tube resists oil and heat. Carcass is braided rayon cord, high strength, super flexible. Smooth, brown, tough synthetic cover resists oil, abrasion, sunlight. 11 sizes stocked from 3/16" one-braid to 1" 2-braid. Working pressures: 200 to 300 lbs. Maximum length approximately 500'.

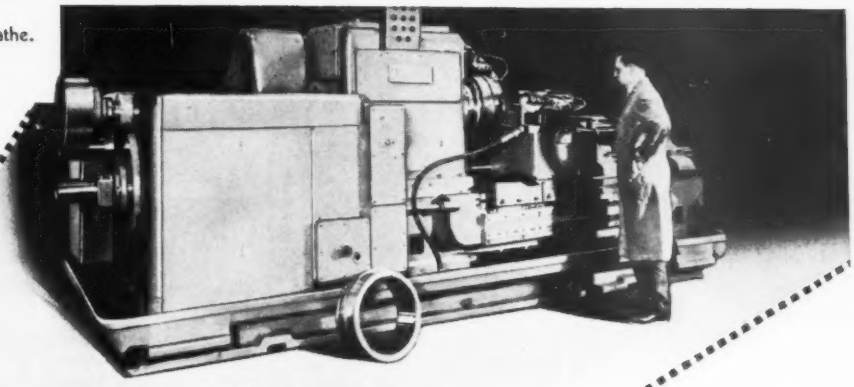
BWH
DEPENDABLE RUGGEDNESS

**BOSTON WOVEN HOSE & RUBBER COMPANY**

**Distributors in all Principal Cities**

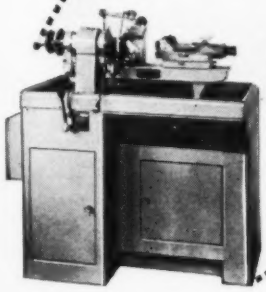
PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

Jones & Lamson 28" Fay Automatic Lathe.
SKF-equipped.



# BIG

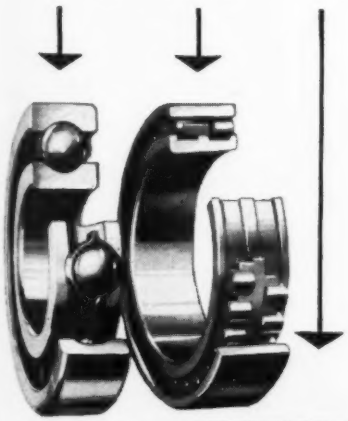
or

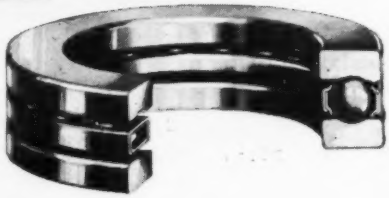


# little

## or in between—
## it's SKF anti-friction bearings for modern machine tools

Wade Precision Hand Screw Machine.
SKF-equipped.





*Removing 98 pounds of SAE 52100 forged steel in 8 minutes* is regular performance for this Jones & Lamson lathe. This tough, exacting job is the machining of inner rings for SKF double-row spherical roller bearings—forming at 330 FPM, turning at 340 FPM. The use of SKF double-row cylindrical and thrust ball bearings gives maximum rigidity at the tool.

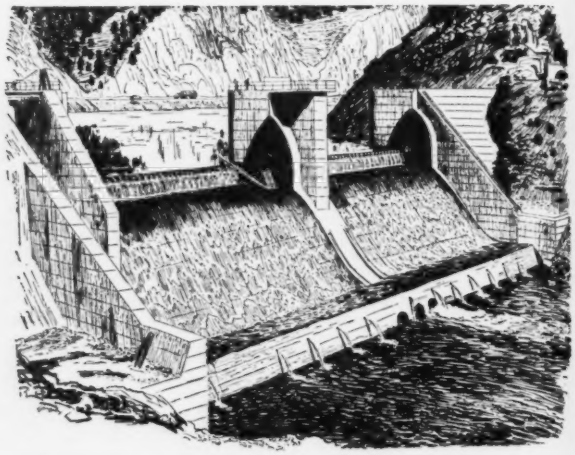
SKF Bearings are also standard equipment on the Wade Precision Hand Screw Machine. An SKF double-row cylindrical roller bearing at the spindle nose gives maximum spindle rigidity and accuracy. In combination with a separate SKF precision thrust bearing, deflection or yield is almost completely eliminated.

Here again is specific evidence that for any machine tool—large or small—wherever a shaft turns, there are SKF Bearings especially designed to maintain accuracy at required speeds and loads. For further information concerning SKF machine tool bearings, ask for Catalog No. 272. SKF Industries, Inc., Philadelphia 32, Pa. 6603

*Machine Tool Bearings engineered by* SKF

# *Low-cost industrial power...* it steps up production here

**Last year** saw 368 new, large industrial and commercial users connected to P. G. and E. lines. Included were oil refineries, steel fabricating and chemical plants. These power needs were met with ample reserves, at rates among the Nation's lowest.



**This year** still more electricity will be poured into P. G. and E. lines. By summer, this huge construction program will have added *nine* new steam and hydro plants since V-J Day. Capacity will reach 4 million horsepower, double 1945's volume!

**This increased capacity** is doubly precious, for it means that more steel, lumber, chemicals, food, defense equipment and other vital materials can be produced right here in the growing, strategic Northern and Central California areas.

**Plans for the future** embrace a continuation of this power-building program. As industry expands, as newcomers move into this area, you can depend on P. G. and E. to do everything possible to supply ample low-cost power for everyone.

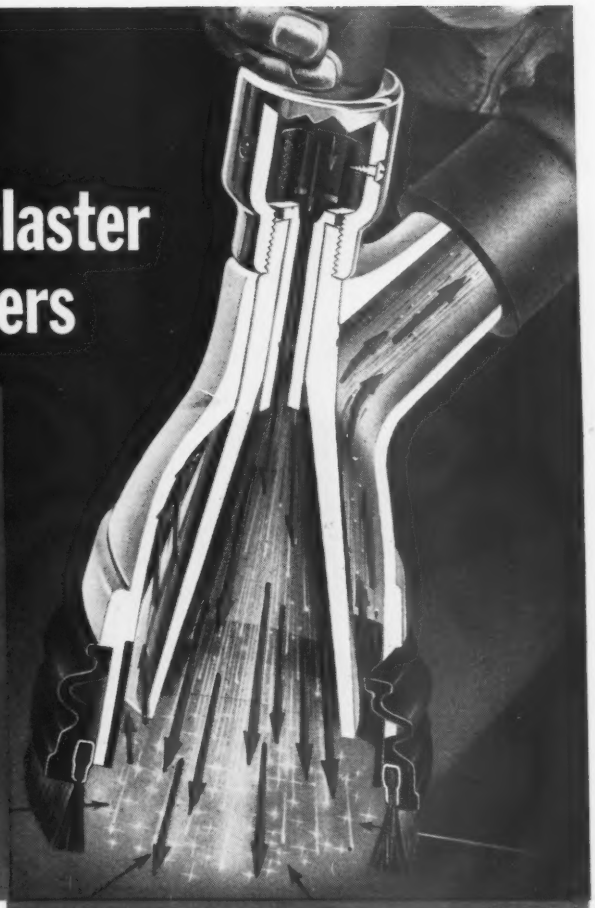
*More power to industry—at rates among the lowest in the nation*

P·G·and E·

3AX-51

PACIFIC GAS AND ELECTRIC COMPANY

# READ HOW amazing new Vacu-Blaster cuts costs for users



"A labor saving of $1,000 per month over our former method:" *Central Valley Pipe Co.*

"Paid for itself in a relatively short period of time:" *Lee Rubber & Tire Corp.*

"Fulfilled our expectations so well we are ordering another:" *Chicago Transit Authority.*

"Vacu-Blasted sheets are superior to ground sheets:" *National Electric Welding Machines Co.*

Vacu-Blaster is the revolutionary new way to blast-clean metal, wood, concrete, brick. Vacuum pick-up eliminates flying dust and dirt. Welders and painters can work right alongside Vacu-Blaster. Operators do not need protective clothing.

It's portable. Perfect for cleaning tanks inside and out. Leaves no mess. Used on ships and other vehicles to remove paint and rust. Brewers use it for cleaning vats. Shippers use it for cleaning inside tank cars. Pipe and steel drum makers use it for edge-cleaning sheets prior to welding. Food processors use it for cleaning floors, walls and ceilings. It can be adapted to blast-clean a thin strip or an entire surface on production line or elsewhere.

It's economical. Vacu-Blaster reclaims and re-uses abrasive.

**No Dust** to contaminate product when food processing plant floors, walls, ceilings are cleaned with Vacu-Blaster. Uses any abrasive.

What Other Tool could do this? Cleaning the inside of a tank or tank car requires a portable tool that leaves no mess—Vacu-Blaster!

**DEMONSTRATION CAN BE ARRANGED!**

VACU-BLASTER

**VACU-BLAST CO. Inc.**

351 Peninsula Avenue • San Mateo, California

## Write for FREE BOOKLET!

Vacu-Blast Co., Inc., 351 Peninsula Ave., San Mateo, Calif.
We would like your free Vacu-Blaster catalogue_____. Wish to arrange for demonstration_____. Our problem is_____

Name_____ Position_____

Company_____

Address_____

*HERE'S THE CRANE FOR*

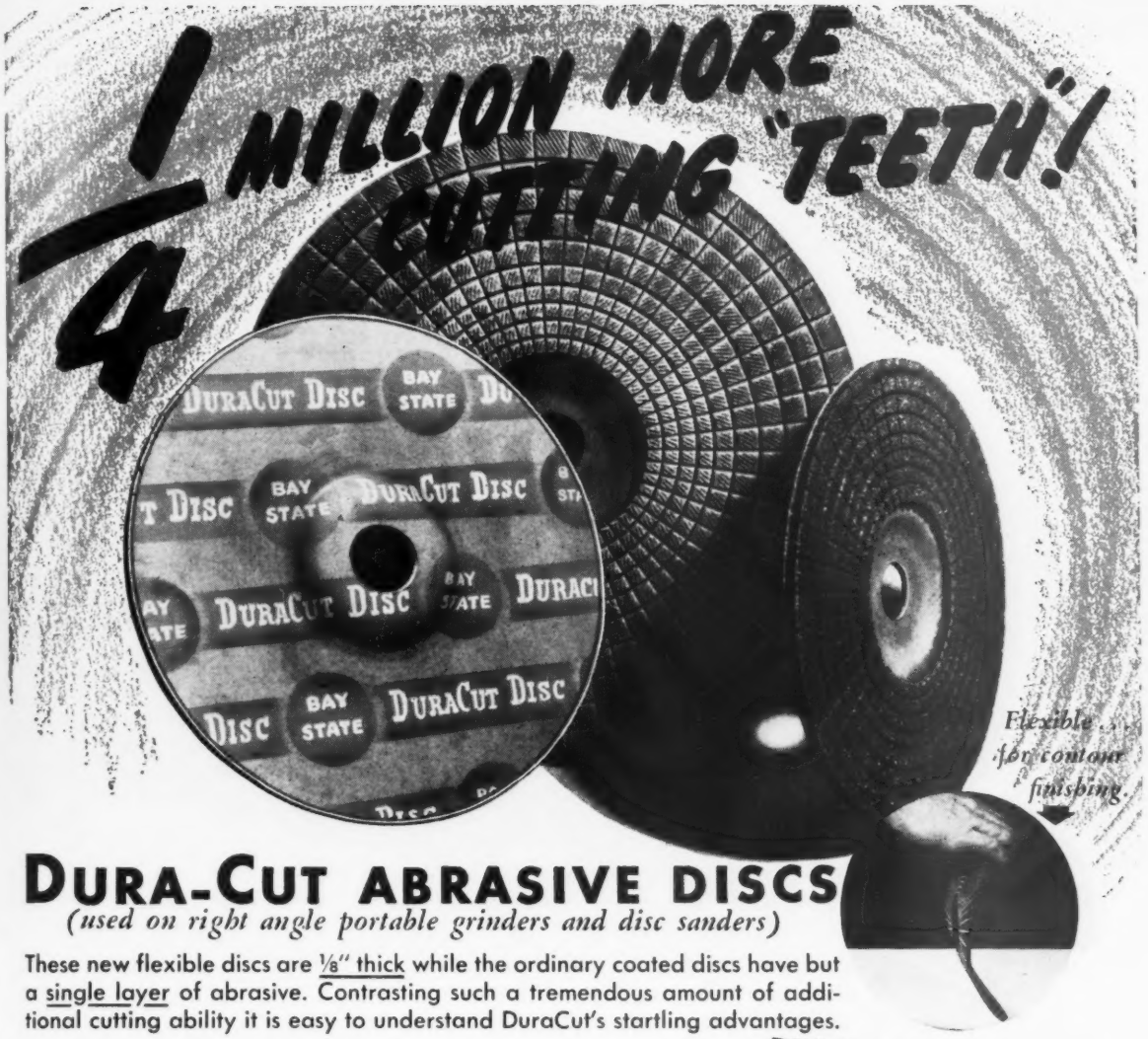
# CONSTANT SERVICE *at* HIGH SPEED

If your handling operations must be "on the go all the time and fast, too", then investigate this American MonoRail Crane. Coupled with constant service at high speed, it offers the advantages of easy movement, rugged construction, low-cost operation and quick installation. But the No. 1 advantage is articulated trolleys. When each trolley wheel carries its share of the load in perfect alignment with the craneway tracks and all possible friction is eliminated, the result is perfectly articulated trolley travel. Applied to American MonoRail Cranes, these articulated trolleys permit operating speeds of 500 feet per minute and constant service. Breakdowns are practically eliminated and the crane is ready for fast service at all times.

An American MonoRail engineer will gladly give you all the details, or write us about the American MonoRail Constant-Service High-Speed Crane.

**THE AMERICAN MONORAIL COMPANY**

**13117 ATHENS AVENUE** **CLEVELAND 7, OHIO**




# DURA-CUT ABRASIVE DISCS

*(used on right angle portable grinders and disc sanders)*

These new flexible discs are 1/8" thick while the ordinary coated discs have but a single layer of abrasive. Contrasting such a tremendous amount of additional cutting ability it is easy to understand DuraCut's startling advantages.

- **Greater economy.**
- **Longer life — 15 to 20 times.**
- **Faster, sustained rate of cut.**
- **Increased labor savings — less disc changing.**
- **Safe — strong — resist tearing.**
- **Available in a wide range of grits, grades and structures — permit control over rate of cut and finish.**
- **Available in raised hub or flat shapes.**

BAY STATE®

Bay State Abrasive Products Co.
Westboro, Massachusetts

*Ask for a demonstration.*

Typical applications . . . Blending and finishing of steel, stainless, alloy steel and aluminum welds . . . Removing rust and scale . . . Finishing sheet metal jobs . . . Auto body work . . . Cleaning weld spatters.

*West Coast Distributor:*

**PACIFIC METALS COMPANY, LTD.**

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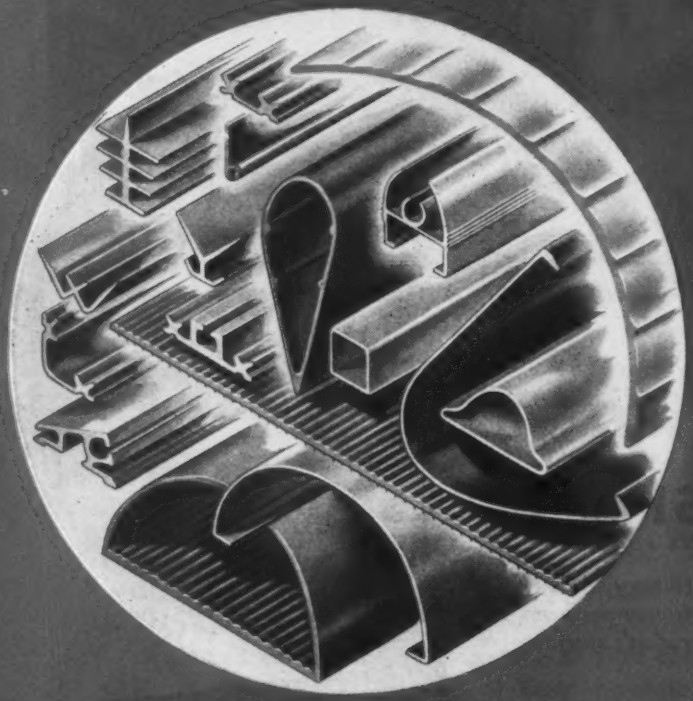
# PLASTIC PROCESS IS "ON THE SPOT"

**with every type of EXTRUSIONS from twelve-inch sections to monofilaments**



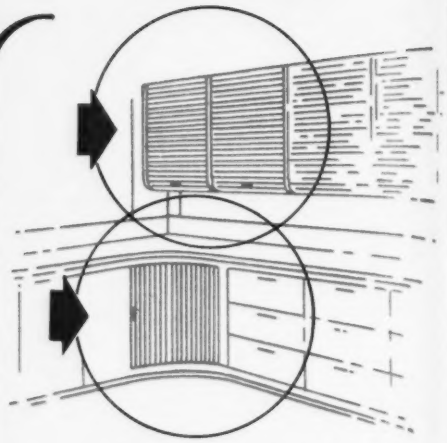
● FIRST to extrude plastics in the West — and first class in equipment, experience and ingenuity of applications.

You can turn your plastic problems over to Plastic Process with complete confidence that if it can be done in plastics, Plastic Process can do it supremely well.

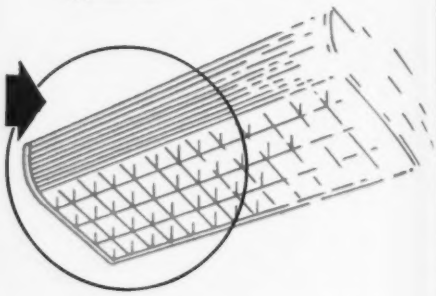
Equipped to handle every type of Thermoplastic Extrusions, including Polystyrene, Tenite, Ethyl Cellulose, Vinyls, Acrylics, Acetates and Polyethylene.

Rods, Tubes, Mouldings, Rings, Beads — practically any form of extrusion you require, in the materials most practical for each application.

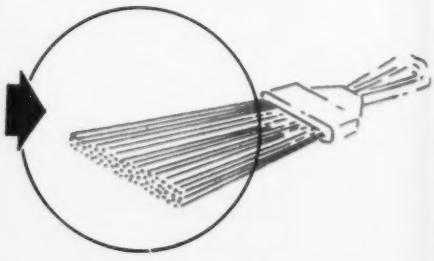
Communicate *today* with our Engineering Division and a competent specialist will be "on the spot" to help you solve your problem of extrusions — with efficiency and ECONOMY.



● THE PLASTIMODE *roll-a-way** door—"up at a touch and out of the way"—is a Plastic Process patent — worth investigating for its multitude of applications in many fields. In many colors. Sanitary, smart, easy to install. Also available in aluminum for industrial applications.



● FLUORESCENT FIXTURES — a Plastic Process specialty virtually since fluorescent lighting became the vogue. Use our wide experience to *your* advantage.



● MONOFILAMENTS of every type, uniform in dimensions, cut to any specified length at no additional charge with our automatic equipment.

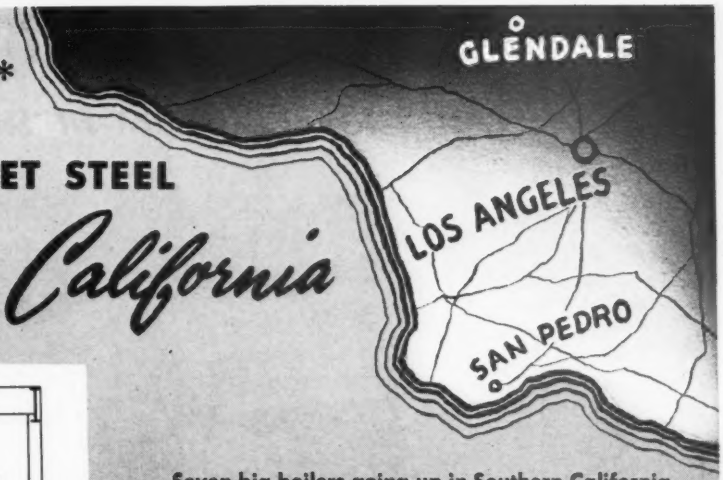
## PLASTIC PROCESS CO., INC.

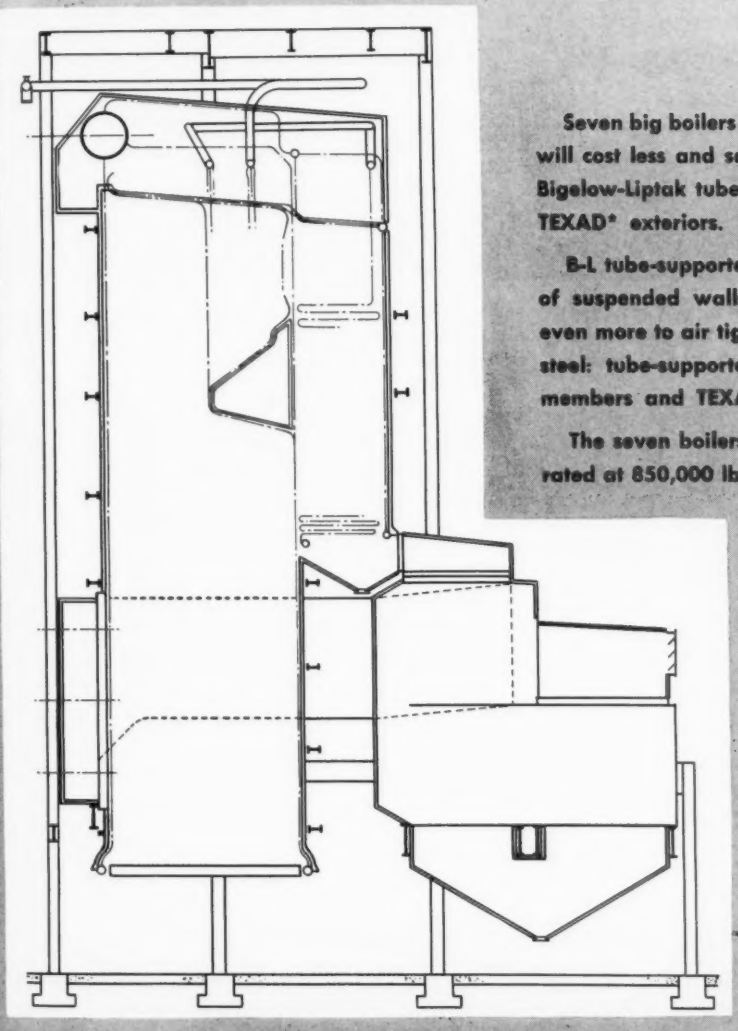
662 NORTH ROBERTSON BLVD., LOS ANGELES 46, CALIF.

# TEXAD*

## SAVES HARD-TO-GET STEEL

## *in Southern California*



**Seven big boilers going up in Southern California will cost less and save steel because specs call for Bigelow-Liptak tube-supported wall enclosures and TEXAD* exteriors.**

**B-L tube-supported walls maintain the principles of suspended walls. Weatherproof TEXAD* adds even more to air tightness. Both developments save steel: tube-supported walls won't need structural members and TEXAD* eliminates plate.**

**The seven boilers — all over 100,000 lb and two rated at 850,000 lb—will be erected in Los Angeles, Glendale and at Terminal Island near San Pedro. In addition, one 400,000 lb boiler and a 100,000 lb unit are now in successful operation in Amarillo, Texas, and Waterloo, Iowa.**

**Write today for information on how these two B-L innovations can work into your plans. Catalogs are available.**

*Bigelow-Liptak is supplying the complete enclosure for this king-sized 850,000 lb boiler.*

*TRADE MARK

# BIGELOW-LIPTAK

*Unit-Suspended Walls + Arches*

BIGELOW LIPTAK Corporation

CURTIS BUILDING • DETROIT 2, MICHIGAN

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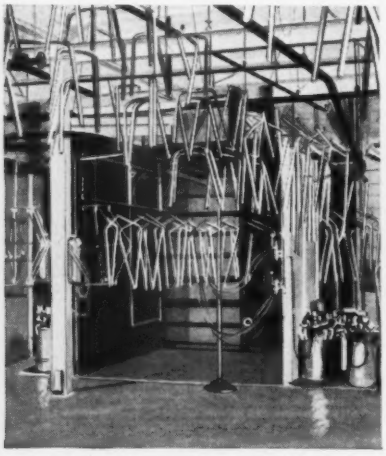
# Want to cut finishing time?

## *CALL YOUR INDUSTRIAL FINISHES SPECIALIST*

**Production costs** would take a nice drop if you could cut finishing time substantially! And how do you know you can't until you consult an Industrial Finishes Specialist? He has solved this problem for many products in many fields. Illustrated below are three ways it's being done . . . without sacrifice of quality!

**Hot Lacquer spraying furniture**



**Electrostatic spraying metal frames**

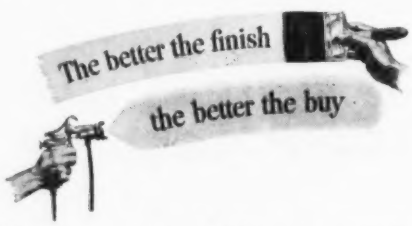
**Steam spraying 300-lb. bombs**

**The recently improved** application of quality finishes, by hot spraying, steam spraying and electrostatic spraying is gaining increased acceptance in the finishing of many products. Spraying of these new lacquers and synthetics by modern methods makes it possible to get superior protection with a single application! Saves spraying, drying, baking and sanding time. Cuts production costs, increases production capacity!

**These are just a few examples** from the files of the Industrial Finishes Specialist!

Whatever your product . . . whatever your finishing problem . . . you'll find it pays to consult an Industrial Finishes Specialist. He's the technically trained, production-minded representative of your Industrial Finishes supplier.

To save production time, increase sales, call him in at the design stage. Remember, more and more of your customers *start buying with the finish in mind!*

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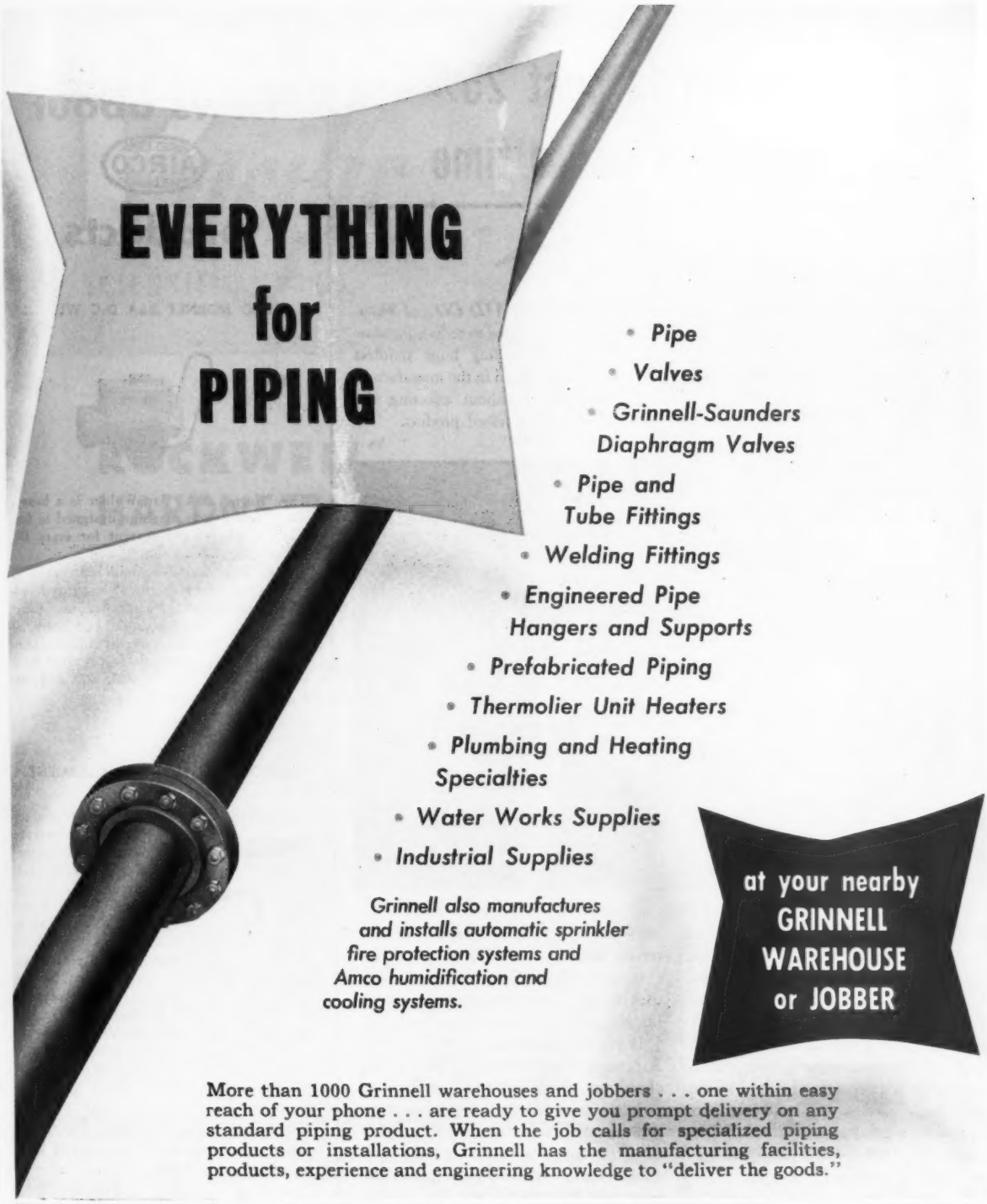
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More than 1000 Grinnell warehouses and jobbers . . . one within easy reach of your phone . . . are ready to give you prompt delivery on any standard piping product. When the job calls for specialized piping products or installations, Grinnell has the manufacturing facilities, products, experience and engineering knowledge to "deliver the goods."

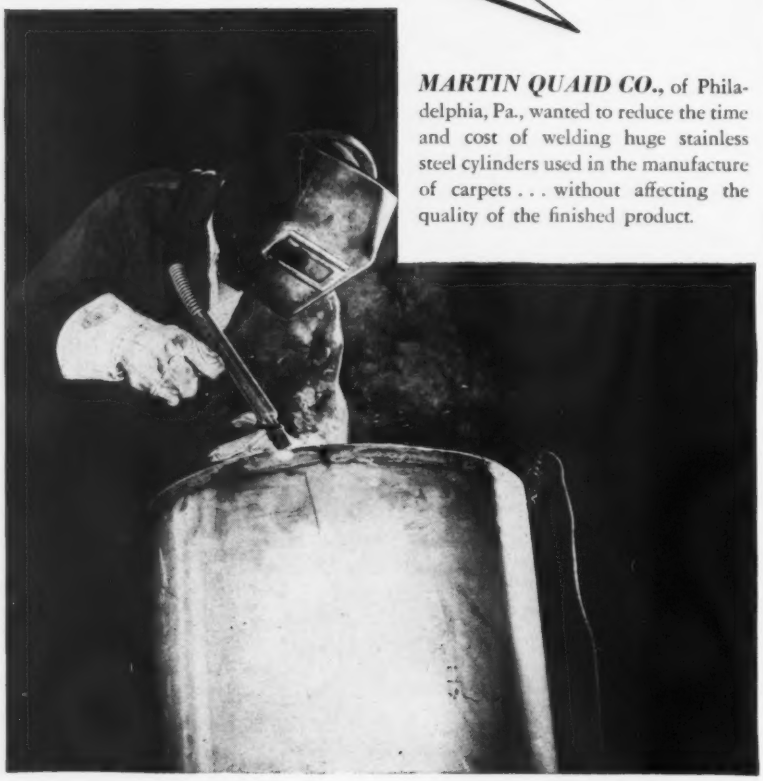
# GRINNELL

**WHENEVER PIPING IS INVOLVED**

GRINNELL COMPANY, INC., Providence, R. I. Warehouses: Atlanta • Billings • Buffalo • Charlotte • Chicago • Cleveland Cranston • Kansas City • Houston • Milwaukee • Minneapolis • New York • Philadelphia • St. Louis • St. Paul

GRINNELL COMPANY OF THE PACIFIC. Branch warehouses: Fresno • Long Beach Los Angeles • Oakland • Pocatello • Sacramento • San Francisco • Seattle • Spokane

# New Aircomatic® Welding Process cuts materials cost 25% ... saves 4½ hours time



***MARTIN QUAID CO.,*** of Philadelphia, Pa., wanted to reduce the time and cost of welding huge stainless steel cylinders used in the manufacture of carpets ... without affecting the quality of the finished product.

***Dana V. Wilcox,*** Airco Technical Service Specialist, was called in. He recommended the use of Airco's new Aircomatic process. The cylinder to be welded was 13' 4" long with an O.D. of 34¾", and a wall thickness of .093 Type 304 stainless steel. After establishing the wire speed to be used in the Aircomatic process, the weld was performed in a total elapsed time of 1½ hours — 4½ hours faster than the former method used.

The operation consumed 6½ pounds of Airco Type 316 stainless steel wire, and 35 c.f.h. of Airco high quality inert gas — all at 25% below the cost of materials used in the old procedure. The customer was well satisfied and now uses the Aircomatic process for fabricating stainless steel as well as aluminum.

If you are interested in applying the Aircomatic process to a particular aluminum, aluminum or silicon bronze, stainless or nickel clad steel fabrication problem of your own, we will be glad to offer technical assistance. If you would like to receive a descriptive bulletin on Aircomatic welding, please write your nearest Airco office for a copy of ADC-661A.

**AIR REDUCTION PACIFIC COMPANY**

AIRCO

A Division of Air Reduction Company, Incorporated

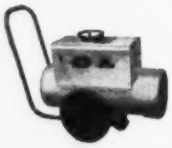
SAN FRANCISCO • LOS ANGELES • PORTLAND • SEATTLE

Bakersfield • Fresno • Emeryville • Sacramento • Tacoma

Western Headquarters for Oxygen, Acetylene and Other Gases... Carbide... Gas Welding and Cutting Machines, Apparatus and Supplies... Arc Welders, Electrodes and Accessories

## news about AIRCO products

### AIRCO HORNET 36A D-C WELDER



The "Hornet 36A" Arc Welder is a heavy-duty, light-weight machine designed to furnish smooth, steady current for every DC arc welding job.

The "36A" features simplified control of current output by means of a sturdy handwheel mounted on the control cabinet. Close calibration of the current dial eliminates the need for meters. Easy reversal of the polarity of the welding terminals is provided by a sturdy polarity switch. 200, 300 and 400 ampere sizes are available.

### AIRCO HELIWELDING EQUIPMENT

All high capacity Heliweld holders are water-cooled to provide sufficient cooling for high currents used. There's the Air-Cooled Manual Holder for light, general-purpose work... the Water-Cooled Manual Holder for heavier, general-purpose work... the Machine Holder for semi-automatic installations... the Automatic Head for the fully automatic operations. Also available is a Heliweld "Bumblebee" for AC heliwelding. This machine has all controls for current, gas and water within its housing, PLUS a one unit power supply.

For more information, write your nearest Airco office today for a free copy of Heliwelding Catalog No. 9.

★ ★ ★

**LIVE DEMONSTRATIONS— AIRCOMATIC AND HELIWELDING— AT BOOTH NO. 152, WESTERN METAL CONGRESS, OAKLAND.**

# Pacific... SCIENTIFIC CO.

SPECIALISTS IN
HEAT TREATING and TESTING EQUIPMENT

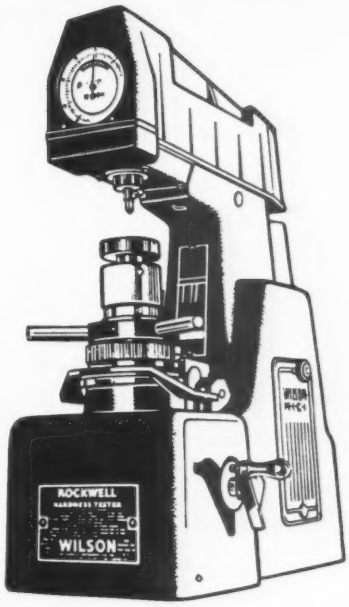
## "ROCKWELL" HARDNESS TESTER

*Made only by Wilson*

### *Guardian of Specifications*

Whether it's material, parts or tools—a product you buy or one you make—if hardness is one of the specifications, it's a very important one. A few points too hard or too soft might be the means of risking thousands of dollars in time and materials.

PACIFIC SCIENTIFIC Engineers are equipped by training and experience to recommend the exact type of hardness testing equipment that will serve you best—make sure that it continues to be dependably accurate.

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**MECHANICAL INSTRUMENT CO., INC.**
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE CO., INC.
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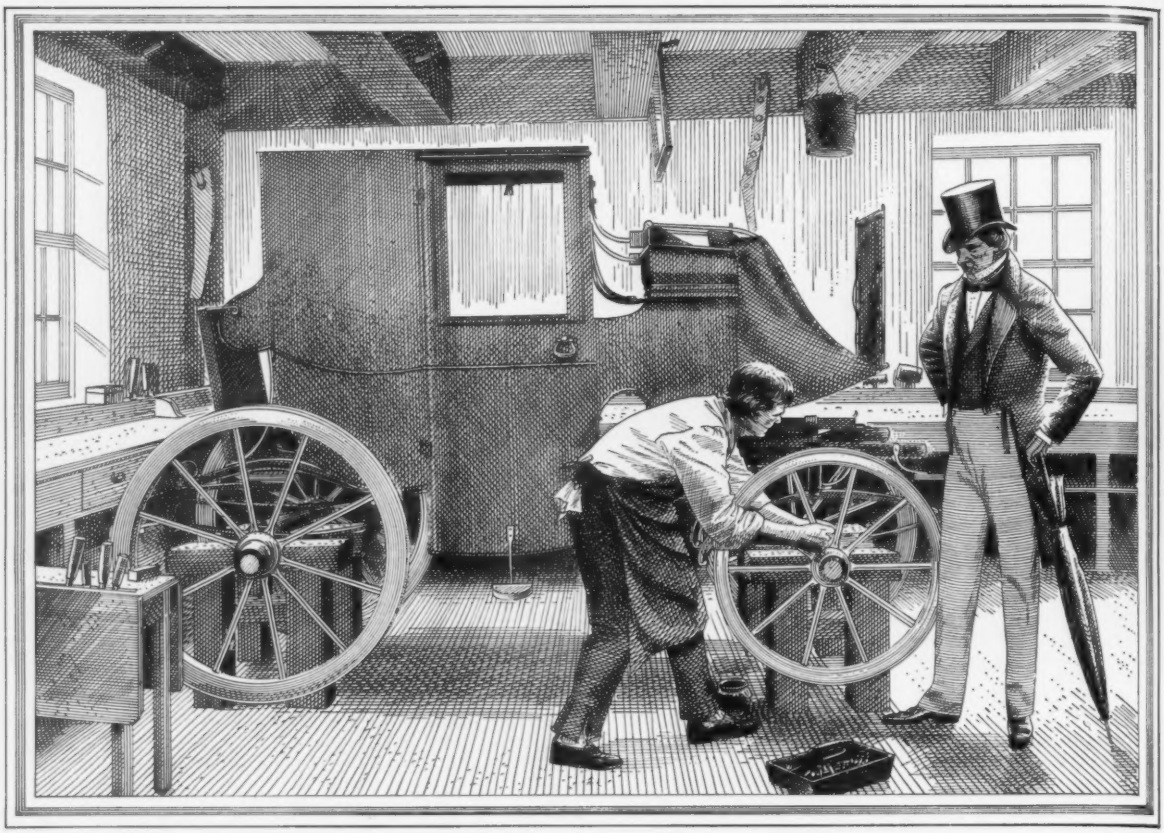

# Craftsmanship.... *1951 Style*

In 1838, Lord Brougham called on one of England's greatest coachmakers to construct a new style of coach invented by his lordship . . . each part to be handmade with craftsmanlike care, even to the carriage bolts.

Especial attention was paid to these bolts that held the other parts together. For it was realized that the performance of the assembled product depended largely on the performance of its fasteners.

Quality fasteners are equally important today to quality products such as modern motor cars. But, 1951 craftsmanship is more easily achieved . . . through the aid of *specialists,* like the RB&W worker in the small illustration. He specializes in fasteners alone, devoting a craftsman's skill to producing bolts, nuts, screws and rivets of uniform accuracy, dependability and physical properties.

Backing up his experience is RB&W's continuous research, development work, investment in large expansion and improvement programs . . . 106 years of experience in making the finest fasteners.

RB&W's extensive Los Angeles facilities will serve you with the quality that *makes strong the things that make America strong.*

**RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY**

**RB&W** *the complete quality line*

106 YEARS MAKING STRONG
THE THINGS
THAT MAKE AMERICA STRONG

*Plants at:* PORT CHESTER, N. Y., CORAOPOLIS, PA., ROCK FALLS, ILL., LOS ANGELES, CALIF. *Additional sales offices at:* PHILADELPHIA, DETROIT, CHICAGO, CHATTANOOGA, DALLAS, OAKLAND. *Sales Agents at:* PORTLAND, SEATTLE. *Distributors from coast to coast.*

# U. S. FLEX Chooses BUTLER Buildings

Butler Building used as warehouse and office by Seattle branch of U. S. Flexible Metallic Tubing Co. Note specially adapted front and sidewalls.

## . . . for These Outstanding Features

**FROM LOS ANGELES, F. A. McDONALD, *General Manager, U. S. Flexible Metallic Tubing Co.,* Writes . . .**

"A number of oil company engineers have complimented us on the appearance of our Seattle Butler Building, and several mentioned interest in this type building for their own storage and operation facilities. All agreed that the building was entirely practical for our type industry, which is a combination of warehousing, sales and service.

"A report received from our Seattle manager states that our building went through a storm of hurricane proportions which hit the Northwest, without a leak or visible signs of other damage.

"Our Seattle members are very happy to be in the new location and our other branches are anxious to have a duplicate set-up in the respective cities."

The U. S. Flex Co.'s Seattle building was occupied just one month after foundation work was begun!

- Speedy Erection
- Dependable Service
- Attractive Appearance
- Complete Adaptability

Interior view of U. S. Flex warehouse shows full usable space provided by Butler Buildings.

***For a Butler Building to Fit Your Needs, See Your Butler Distributor, or***

BUTLER®

**BUTLER MANUFACTURING COMPANY**

RICHMOND, CALIF.
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**Mail This Coupon TODAY!**

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Send full information about Butler Buildings for use as_____

Name_____

Firm_____

Address_____

City_____ Zone_____ State_____

# A better days work–Around the Clock–

## The New WHITE 3000

**NIGHTS**—This White 3022 Pay Load Tractor makes three round trips between Los Angeles and Santa Ana.

**DAYS**—The same White Tractor is used for local city deliveries.

SOUTHERN CALIFORNIA SoCal Freight Lines
GENERAL OFFICE: 1121 MATEO STREET
LOS ANGELES 21, CALIFORNIA

August 9, 1950

This White series 3000 tractor is helping our drivers turn in a better day's work, and yet--because of extra comfort and easier handling--to still feel comparatively fresh at the end of a shift. The tractor itself does double-duty; hauls twin semis on three round trips between Los Angeles and Santa Ana every night and makes local deliveries with a 21' trailer every day. Performance, both through city traffic and on the highway, is excellent.

All of us here at Southern California Freight Lines share our drivers' enthusiasm for this fine equipment. The White 3000 is in fact a revolutionary improvement in motor truck design.

Yours very truly,

E. Kuerbis
Vice-President

EK/slb

**Wherever White 3000s** are on the job you'll find the same enthusiasm...and logically so, because here at last is a *machine tool of transportation*—a completely new motor truck which does more work, earns more profits for you! Get the facts. Let your local White Representative show how *your* business can benefit by the proven advantages offered exclusively in the new White 3000.

**WHITE 3000's PROVEN COST-SAVING ADVANTAGES**

1. Saves driver time and energy ...gets more work done.
2. Complete front end accessibility cuts maintenance cost. Makes service easier.
3. New safety features.
4. New weight distribution permits longer bodies...more payload.
5. Saves space on the street...in the garage...better maneuverability.

**THE WHITE MOTOR COMPANY**
CLEVELAND 1, OHIO, U.S.A.
*Pacific Coast Branches and Dealers in all important cities*

White SUPER POWER 3000

**FOR MORE THAN 50 YEARS THE GREATEST NAME IN TRUCKS**

# "Putting the Pressure" on SPEED NUTS

## . . . to assure highest quality fasteners for your products

*Fasteners must not fail.* They are assigned important functions in the assembly of all types of products. And it is up to the fasteners to meet this responsibility.

By way of assuring the successful performance of SPEED NUTS, Tinnerman Products has perfected a system of vigilant quality control.

A key step in these control procedures is determining the average installation torque for each SPEED NUT. This is established by the Mechanized Torque Tester, a special "torture rack" designed by Tinnerman engineers. The torque values set up by this tester assure the extreme holding power and great vibration resistance of SPEED NUTS.

This is only part of the Tinnerman quality control program. The entire procedure has been described in a new illustrated booklet, "The Story of Quality"—write for your copy. TINNERMAN PRODUCTS, INC., Dept. 12, Box 6688, Cleveland 1, Ohio. In Canada: Dominion Fasteners Ltd., Hamilton. In Great Britain: Simmonds Aerocessories, Ltd., Treforest, Wales.

***Visit Tinnerman at the Metal Show—Booth 871***

Test plates containing SPEED NUT and screw are inserted in Torque Tester. Rotating screwdriver bit engages screw. Dials register inch-pounds of installation, back-off and destruction torque.
TINNERMAN
Speed Nuts

# For YOUR NORMAL NEEDS

LYON offers more than 1500 regularly cataloged items of steel equipment engineered to meet your civilian or defense production requirements. See list below.

# For DEFENSE SUBCONTRACTS

Complete sheet metal facilities to handle gauges 10 to 24. Two strategically located plants, 1500 trained workers, our own toolrooms, 3800 contracts in World War II.

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***Shipment from Pacific Coast Points***

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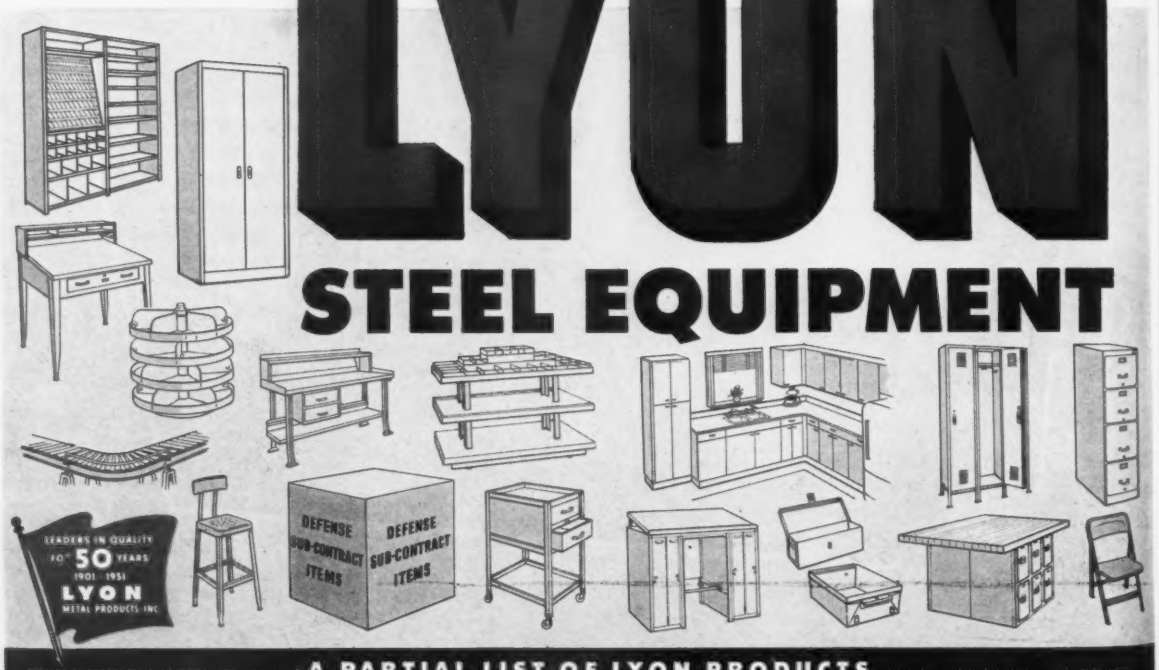
# LYON STEEL EQUIPMENT

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- Revolving Bins
- Hanging Cabinets
- Filing Cabinets
- Folding Chairs
- Work Benches
- Bench Drawers
- Service Carts
- Sorting Files
- Drawer Units
- Hopper Bins
- Tool Stands
- Shop Boxes
- Tool Trays
- Shop Desks

## CALENDAR OF MEETINGS

March 19-23—Seventh Western Metal Congress and Exposition, Civic Auditorium, Oakland, Calif. Contact Wm. Eisenman, Managing Director, 918 Fallon St., Oakland 7, Calif.

March 22-23—Illuminating Engineers Society, at Davenport Hotel, Spokane. Contact Mr. Plowman, (MA 5121), Spokane.

March 22-23—Pacific Northwest Industrial Waste Conference, at Pullman, Wash. Contact Division of Industrial Services of the Washington State Institute of Technology, Pullman, Washington.

March 24—Pacific Northwest Advisory Board, at Portland. Contact A. M. Cloninger, 624 Vance Bldg., Seattle, Washington.

March 26-27—Automotive Electric Assn., at San Francisco. Contact S. W. Potter, Exec. Sec., 800 Michigan Bldg., Detroit 26, Mich.

March 27-30—Intermountain Logging Conference, at Davenport Hotel, Spokane. Contact Chas. Keim, Kalispell, Montana.

March 29-30—West Coast Lumbermen's Assn. regional meeting at Multnomah Hotel, Portland. Contact H. V. Simpson, 1410 S.W. Morrison St., CA 1691.

March 30—Western Frozen Food Processors Assn. annual meeting at Casa del Rey Hotel, Santa Cruz.

Apr. 4-6—Association of American Battery Manufacturers, at San Francisco. Contact Walton R. Smith, Pres. No. Calif. Battery Club, c/o States Batteries, 1 Arkansas St., San Francisco.

Apr. 9-20—Armed Forces Field Economic Mobilization Course for Reserve Officers and civilian representatives of industry, Seattle, Wash. Contact Armed Forces Public Information Office, 1611 West Wheeler St., Seattle 99, Wash. (AL 8484).

Apr. 10-11—Wood Products Clinic, at Davenport Hotel, Spokane. Contact Mr. Batdorf, Spokane (MA 2526).

Apr. 16-18—Pacific Northwest Bakers Association, at Multnomah Hotel, Portland. Contact M. J. Holbrook, 623 S.W. Oak St., (BR 0553), Portland.

April 20-21—Pacific Northwest Purchasing Agents Conference, at Multnomah Hotel, Portland. Contact Don Woodman, Purchasing Agents Assn. of Oregon, P. O. Box 1269, Portland, WE 6796.

Apr. 23-24—Pacific Northwest Trade Assn., at Multnomah Hotel, Portland. Contact Arthur J. Farmer, Chamber of Commerce (AT 9411), Portland.

Apr. 27—Industrial Minerals Congress, at Portland. Contact R. S.

(Continued on page 30)

# EDITORIAL COMMENT

## Let's Protect Ourselves

WE HAVE been asked why, with the growing importance of metal industries in the West, we have so little representation on emergency committees of government that plan for the regulation of these industries during times of emergency. In other words, why doesn't the West have greater representation on the industry advisory committees of the National Production Authority? Unquestionably we should have, for in the coming era of emergency controls there is great danger of unrealistic regulatory measures being promulgated by Washington authorities who have a tendency to assume that Boise is only an hour's drive from Burbank, that Phoenix is just up the river from Portland, and that our industrial performance and potential are the same as they used to be back in 1910.

It is encouraging to learn that the Los Angeles Chamber of Commerce recently decided to ask the NPA to appoint California businessmen on its industry advisory committees in proportion to the size and economic importance of California. Not only that, but the chamber sent its president, Oscar Trippet, and general manager, Harold Wright, to Washington in the interest of furthering this request.

So far so good, but we believe that chambers of commerce and other organizations would do better to make their appeal on behalf of the whole West, rather than merely for their own immediate localities or states. We need united action by the entire West, so that our voices will really be heard, and we also need appreciation right here at home of the fact that the West is one economic area.

## A Bread-and-Butter Program

ALL THOSE who attend the Western Metal Congress and Exposition in Oakland this month will find the affair far more closely related to their immediate needs than ever before.

In deciding to concentrate on the problems of the small manufacturer and to deal specifically with the oil and aircraft industries, the management took a long step forward from the previous procedure of endeavoring to cover theory as well as practice of everything that comes under the general subject of metals. The latter is a very hazardous means of attracting and sustaining interest.

In time to come we may find this biennial event reaching out a bit farther in the West and dealing with those problems of the wood and mining industries that are related to the use of metals.

## Mostly No-How

"WHAT this country needs is not so much a 5¢ cigar as it does a new, shorter and more pleasing word for that gangling hybrid 'Know-How'," says the *Production Expediter,* that newsy publication of the Los Angeles Department of Water and Power. "Surely somewhere in this great nation a genius exists who can coin a more euphonious and dignified word denoting 'Savvy'."

Sorry, Mr. Production Expediter Editor, we don't know how to say know-how the right way, no how. Somehow we just haven't got enough know-how, no-how.

# Big steel Mill saves:

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## CALENDAR OF MEETINGS

(Continued from page 29)

Mason, Woodlark Bldg. (BR 2276) Portland.

May 7-9—Northwest Electric Light & Power Assn., Business Development Section, at Multnomah Hotel, Portland. Contact Berkeley Snow, Corbett Bldg. (AT 7871), Portland.

May 8-11—Insulation Board Institute, at San Francisco. Contact B. J. Blackburn, Mgr., 111 West Washington St., Chicago 2, Illinois.

May 14-19—American Trucking Assn. at San Francisco. Contact Kenneth Beadle, c/o Pac. Inter-Mt. Express Co., Oakland, Calif.

May 16-18—Northwest Electric Light & Power, at Davenport Hotel, Spokane. Contact Berkeley Snow.

May 24-26—Washington Motor Transportation Assn., at Davenport Hotel, Spokane. Contact Mr. Carleton (MA 7131).

May 31-June 1—Western Forest Products Safety Conference, at Multnomah Hotel, Portland. Contact E. H. Crosby, Columbia River Loggers Assn., Portland. BR 0479.

June 7-9—Rocky Mountain Coal Mining Institute Convention, at Hotel Utah, Salt Lake City. Contact Walter F. Clarke, Gen. Mgr., Independent Coal & Coke Co., Salt Lake City.

June 10-13—Triple Industrial Supply Convention, at San Francisco. Contact Exec. Secy. Natl. Supply & Machinery Distributors Assn., H. R. Rinehart, 505 Arch St., Philadelphia 6, Pa.

June 11-12—Pacific Northwest Section of American Association of Cereal Chemists, at Davenport Hotel, Spokane. Contact Mr. Montzhermeir (KE 2636).

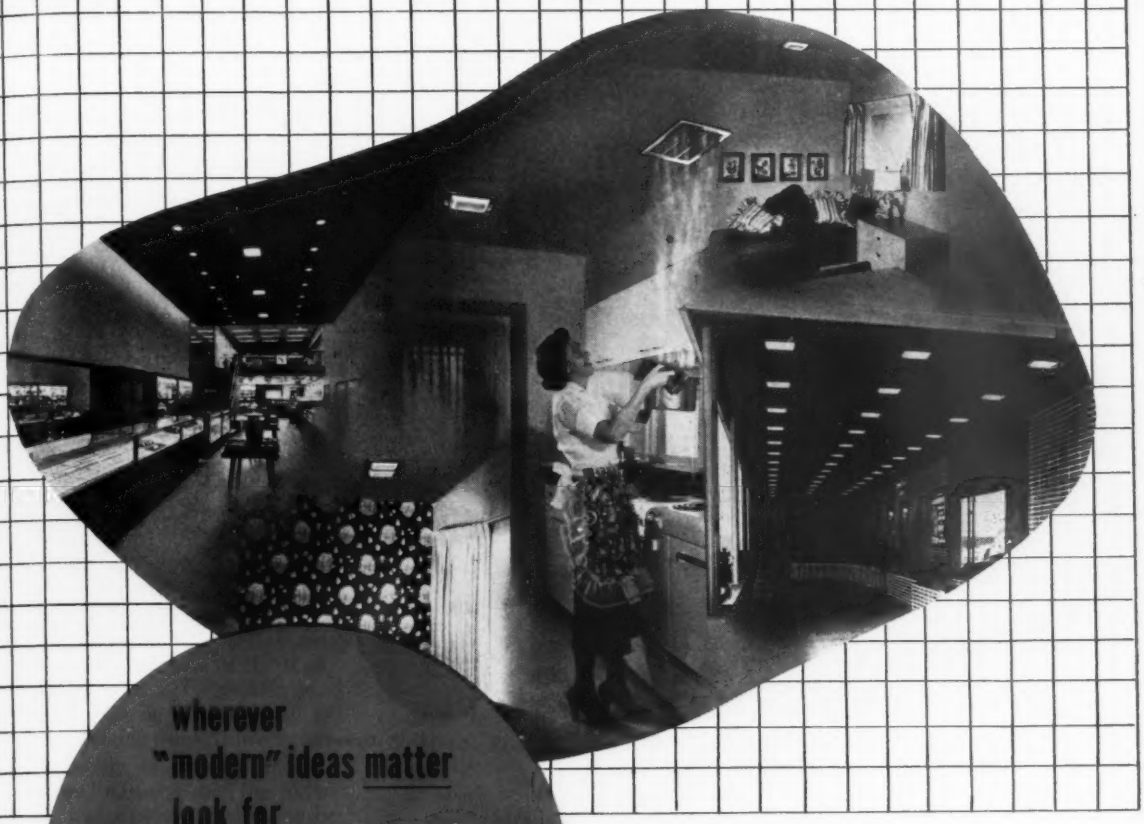
June 14-16—SPI Pacific Coast Chapter conference, the Society of the Plastics Industry, at Tahoe Tavern, Lake Tahoe, Calif.

June 15-30—First Seattle International Japanese Trade Fair, Seattle, Wash. Contact Robert Story, Mgr., World Trade Division, Seattle Chamber of Commerce, Seattle.

June 24-29—American Pulp & Paper Mill Superintendents Assn. national meeting at Multnomah Hotel, Portland. Contact R. B. Morden, Morden Machines Co., Pacific Bldg., Portland. BE 9354.

July 1-4—American Society of Heating and Ventilating Engineers national meeting, at Multnomah Hotel, Portland. Contact Bert Farnes, Farnes & Martig, 417 N.E. Couch St., Portland. EA 1949.

July 8-13—Natl. Flat Glass Jobbers Assn., Mirror Mfgrs. Assn., at San Francisco. Contact Miss Minita Westcott, Ex. Sec., 2217 Tribune Tower, Chicago 11, Illinois.



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J. W. Queen

# Ryerson Consulting Service at ASM Booth 751

Here are some of the men you'll meet when you visit our booth at the Western Metal Congress. Each is an authority in his special field, be it alloy, stainless, or carbon steel. All will be ready to consult with you at Oakland.

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# METALS AND METALWORKING NUMBER

FOR THE METAL and metalworking industries of the West, the year 1951 is a striking parallel to 1941 in one respect, and an even more striking contrast in another.

Consequently this special number of *Western Industry,* and the Metal Congress and Exposition about to be held in Oakland, are of particular interest, because they chronicle the significance of two notable decades in the industrial history of the West.

### Contrasting Decades

Both decades have begun with a war economy beginning to dominate the situation. Both have been marked by mounting military demands for industrial products, by limitations on supplies of materials, and by controls intended to hold down civilian consumption so that the military establishment could function properly.

But here the comparison ends and the contrast begins. Ten years ago most of the supplies of metal for metalworking operations had to come from the East, because the volume and range of products turned out from Western mills was small. Today we have new steel mills and a wide range of new products, new aluminum reduction and extrusion facilities, tube mills, wire mills, an electrolytic copper refinery, and other facilities.

We have also vastly increased supplies of hydro-electric power with more to come, supplemented by big steam generating plants, natural gas piped in from Texas to supplement California's limited sources, with prospects of gas from Alberta to supply the Pacific Northwest. We have petroleum production far exceeding that of 1921.

Furthermore, the growth of Western industries of all kinds has increased the demand for machinery, equipment and supplies far beyond that of 1941.

In short we have a solidly-based and self-reliant industrial economy which would have seemed a fanciful dream ten years ago.

But even more striking than all these physical changes is the transformation that has come to pass in industrial methods. Compare what passed for efficiency in 1941 with what is standard practice today. To put it frankly, industry in the West was in the kindergarten stage.

For example, take the matter of quality control and inspection. Many of the largest plants seemed to have no conception of metal standards. Establishments with labor forces of more than 1,000 men were attempting to turn out work that could not meet the inspection standards of the armed forces. Their ignorance of the use of gages was abysmal.

In some cases the military authorities had to threaten to close plants down unless they reformed their methods within 48 hours. In fact, the West owes a big debt of gratitude to Army Ordnance, Chemical Warfare Service, the Navy and Air Corps for their insistence that standards be adhered to, and that their requirements be met.

### Quick Transformation

Today practically everyone in the West knows these fundamentals as well as anyone else in the country. In one decade a tremendous change has taken place, actually a transformation that in the older industrial areas of the United States took place over a long period of years.

What lies ahead? In the first place, the continuing population growth in the West, which was astounding in the last decade, seems likely to set new records in the decade whose threshhold we are now crossing. Consequently the demand for metals and metal products is bound to increase accordingly.

But the remarkable demonstration of progress in industrial methods made in the West indicates an awakening and alertness which may result in remarkable new ideas and methods in which the West may lead the country.

**Metal Consumption in the Eleven Western States**

(As shown by the 1947 Census of Manufactures)
(In Tons)

| | |
|---|---|
| Steel mill shapes and forms | 2,549,654 |
| Iron castings, rough and semi-finished | 174,754 |
| Steel castings, rough and semi-finished | 46,238 |
| Brass and wire mill shapes and forms | 22,703 |
| Copper and brass castings, rough and semi-finished | 13,299 |
| Aluminum mill shapes | 31,316 |
| Aluminum castings, rough and semi-finished | 12,141 |

(For more details see page 38)

# WHAT'S AHEAD

## For the Metal and Metalworking Industries of the West

A picture of trends, developments, possibilities and needs is presented here by the chairmen of the Western chapters of the American Society for Metals, who were asked by *Western Industry* to join in a symposium. The questions which they have answered in their contributions are as follows:

1. *What trends in fabrication of metal products do you see developing in the West?*
2. *What new uses for metals do you foresee?*
3. *What metals seem to show the greatest promise of future development?*
4. *What new types of metal are most likely to be demanded by industry?*
5. *Along what lines do Western fabricators most need to be educated?*

***Grobecker predicts . . .***

### Nuclear power means liquid metals

NEW FIELDS for the metal industries will appear when atomic energy is utilized as a source of heat and electricity and as propulsion power for ships and aircraft. Though the spectacular aspects of nuclear energy have often been exaggerated by the press, the facts remain that one pound of uranium will release an amount of energy greater than 2,000,000 pounds of coal and the energy reserves of uranium many times exceed those of petroleum.

The newness of the technology and our ignorance in the nuclear field make atomic energy costs extremely high. However, indications are that the costs of nuclear power will drop in future years while the cost of power produced from other sources will continue to increase.

The development of nuclear power for industrial applications will be expensive and difficult with many problems imposed on the metal industries by the characteristics of nuclear reactions.

1. For reasonable thermodynamic efficiency it will be necessary for reactors to operate at temperatures well above the conventional engineering range. The use of liquid metals with all the associated corrosion, erosion, purification and pumping troubles will probably be required by heat transfer rates far transcending previous experience.

2. All materials involved in a reactor are subjected to intense radiation bombardment, and to a varying extent are subject to radiation damage. This consists of progressive changes in physical properties and dimensions and transmutation into other elements.

3. The nuclear properties of the structural materials must be such that the capture of neutrons is a minimum to prevent the reduction of reactor efficiency.

4. Radiation hazards will require the development of adequate shielding materials and techniques. The equivalent of six feet of concrete surrounding a reactor will be necessary.

Investigative work comparable to the studies making possible the steel and aluminum industries may be required for uranium, the trans-uranic elements, zirconium, titanium and many other metals. High standards of chemical purity will introduce problems in the extraction and melting of metals. Ingenuity will have to be exercised to fabricate the special metals into desired shapes. Physical soundness and internal structure must be closely controlled.

Some of the parts required for atomic energy applications could be fabricated in industrial shops today, while others could be produced with minor modifications of industrial fabrication methods. Production of a few of the vital parts will require such a degree of precision that close instrumentation control will be necessary.

If atomic power is to be used to its fullest potentialities, industry must be prepared to overcome the obstacles and create an economic asset in the use of atomic energy.

***Rosenblatt feels . . .***

### Small fabricator needs protection

THE PRIMARY concern of the fabricators and the foundries and of almost anyone connected with the metals industry is crystallized in a rather complex question; can the present state of confusion eventually give way to an orderly system of production and allocation, and will the international situation prevent any semblance of business as usual to prevail, if so, how soon can Washington find workable means of control whereby the small fabricator will be able to obtain sufficient steel and la-

bor to make his contribution to defense and essential civilian activities?

As to the specific questions they may be briefly answered as follows:

1. The trend of metal products fabrication will turn sharply away from non-essential items toward "D. O." material.

2. New uses of metals will probably be postponed unless they are in connection with government requirements.

3. Future developments will be strictly limited with regard to any metal until current supply problems are resolved.

4. Industry is likely to demand any metal that will be available outside of anticipated restrictions.

5. The education of the Western fabricator which could now serve the highest purpose would give him a knowledge of how to produce under the most miserable obstacles and still retain a sense of humor.

*Stark reports . . .*

## Use of Heliarc welding widening

ONE OF THE MOST versatile of recent broadly applied fabrication trends has been the greatly increased usage of the so-called "Heliarc" or inert gas arc welding. Argon is the inert gas widely used at the present time.

This process, in the hands of skilled personnel, produces a clean, high-strength weld in aluminum alloys used in the aircraft industry without subsequent finishing operations. The same process is also achieving widespread use in the welding of stainless steels.

Another recent fabrication development has been the stretch forming of very large aluminum sheets, such as those used for the forming of aircraft engine cowling sections. One process uses a very large (approximately 700 ton) double acting hydraulic press.

A new use of metallic materials that is being studied and applied in the aircraft industry, is the process known as "Metal-Bond." This is the use of a composite layered structure of a plastic impregnated tape and metal sheet. The metal used is usually a high strength aluminum alloy.

The usage of powder metallurgical parts for certain portions of rockets is another subject undergoing continued consideration.

Among the most promising of the newer metals, as far as future applications is concerned, is the metal titanium and some of its more recent alloys. Titanium, and titanium with small amounts of carbon and titanium-manganese alloy, offer materials of very high strength weight ratio and high retained strength at moderately elevated temperatures. In addition to these properties, all these materials have generally excellent corrosion resistance and high corrosion resistance to sea water or salt spray corrosive attack.

Ductile molybdenum and ductile zirconium, especially in sheet form, could prove useful for very specialized applications. The electronics industry already makes some use of ductile molybdenum sheet.

New types of metallic materials that probably will be most in demand by industry include the group that would combine high strength weight ratio with high corrosion resistance and resistance to stress corrosion. Materials with high machinability and good weldability combined with high physical properties will most likely be welcomed for stringent design and production requirements.

It would be my opinion, that the most useful lines of education for Western metal fabricators would be:

1. The machining of modified stainless steels, such as those used for high temperature service.

2. The machining and fabrication of high temperature alloys (or so-called "super-alloys").

3. The design use and methods of application of recently developed welding methods, such as consumable electrode welding and inert, gas-shielded consumable electrode welding.

*D'Amico informs . . .*

## Unheard of interest in 17% chrome

THE PROBLEMS faced by steel consumers in the immediate future will depend to a large extent upon whether they are manufacturing goods for commercial consumption or for defense orders. Needless to say, the manufacturer of commercial commodities will have an increasingly more difficult procurement problem as the defense effort is expanded and gradually embraces a larger percentage of the production facilities available in the area.

Even on defense contracts substitutions may be necessitated by the restricted uses of, heretofore, common alloying elements. The restriction in the use of these alloys, as a matter of fact, is already setting up a trend or pattern in the alloy and stainless fields and might well establish a substitute list of materials to be used in the critical period which lies ahead.

In the field of alloy constructional steels, the government has limited the use of nickel and molybdenum in steels produced for commercial use. This has created many problems in the oil tool industry, which is one of the larger users of alloy steels in the Southern California area. These changes and restrictions have taken place so quickly no universal substitutes have yet been offered by the mills. It is difficult to predict what thinking might

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motivate the pattern of substitution on commonly used alloy steels now used by the oil tool industry, such as AISI 4620, 4820, 4140 and 4340.

Automotive and commercial spring manufacturers, important consumers of alloy steels in this area, have not been greatly affected by recent alloy restrictions because the steels they use will primarily be straight chrome or chrome vanadium types. Some carbon molybdenum (AISI 4048) is being used and this material will undoubtedly have to be replaced by one of the other grades mentioned above.

The aircraft industry is the third of the larger users of alloy steels in this area. Restrictions on the use of nickel and molybdenum have not been applied to alloy steels purchased to aircraft specifications. For this reason we do not anticipate any modifications in the alloy aircraft steels presently used.

The stainless picture from the point of view of the manufacturer of commercial commodities will undergo an immediate change because of NPA's recently issued regulation M-14. This regulation states that after March 1 the use of nickel bearing grades of stainless steel will be prohibited in an extensive list of over 400 items. Nickel bearing grades of stainless can only be used in these items provided the stainless steel operates as a functional part of the equipment and cannot be a non-nickel bearing grade of stainless.

The effect of this regulation has already promoted an unheard of interest in the 17 per cent chrome, (Type 430) sheet and strip. The type of stainless commercial product which will be made during the period of nickel shortage will be, therefore, limited by the corrosion resistance and the mechanical and working properties of Type 430 stainless.

Restrictions in the use of columbium stabilized stainless steel (Type 347) has already influenced many users to adopt the titanium stabilized alternate (Type 321). This choice has been made by many in preference to the newly developed columbium-tantalum stabilized material because of limited metallurgical laboratory data available and, of course, no field service life record.

It is apparent that the extra low carbon grades of stainless melted to a .03 per cent maximum carbon will receive a rapidly increasing amount of consideration in fabricated parts. This development eliminates the use of any stabilizing agent in many fabricated articles and its field of application has barely been scratched.

The shortage of selenium will apparently make it necessary for industry to use resulphurized rather than selenium-treated bars which have been normally used in this area for quite some time. Little difficulty will be encountered in machining. The inferior weld ability and cold swedging properties of the resulphurized bars must be recognized to avoid trouble.

We are rapidly approaching a consumption rate of alloy and stainless steel in this area that will surpass any figures established in the past. Substitutions in grades of material which have already been necessitated by alloy shortages will probably be changed again as other shortages develop. I am certain that the steel industry and the steel users in this area will solve the problems which arise in the critical future ahead by close cooperation and mutual assistance to each other.

*Clarke suggests . . .*

## Watch corrosion resistant alloys

THE INFLUX of process industries into the Northwest is causing concentrated attention to be accorded the highly corrosion resistant alloys, insofar as fabricators are concerned.

Undoubtedly the most exacting demands along this line are emanating from the requirements of the atomic energy and allied plants at present. However, more and more highly specialized equipment is being required by private enterprise. In most cases this special equipment involves the use of the high alloys.

Many fabricators in the Northwest are in a fortunate position for work of this nature by virtue of their close association with the pulp and paper industry for some time. The pulp and paper industry has long been a leader in the battle against corrosion of equipment and against contamination of end products. Thus the fabricators have been required to keep abreast of the demands of industry in this phase of work.

In addition to the process industries, the major hydro-power development program as now projected will place heavy demand on the fabricating shops in the Northwest for many years to come. The items involved in this program may be termed standard plate and structural products, and fortunately the continued advance in the field of automatic welding is contributing in large measure to efficient production in the heavy shops.

Aluminum and magnesium alloys are rapidly increasing in importance, especially in the transportation field, and are deserving of careful attention by progressive fabricators. Some of these lighter alloys will lend themselves to application in the field of agricultural products containers. The present widely used wooden containers have a high mortality rate and are difficult to store efficiently.

All factors considered, however, the high alloys will very probably prove to be the prime metals involved in the future development of Western industry. All that is now needed is for the metallurgists and producers to develop new metals at reasonable cost to supplant the well known stainless steels and nickel-copper alloys which require such large quantities of the very scarce

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alloying elements, and which will still retain the anti-corrosion and strength properties of the present alloy families.

The complications arising in the handling of the presently known high alloy materials are many and varied. Only thorough knowledge on the part of key personnel in fabricating plants along the lines of metallurgy will insure against costly errors in procedure.

It is essential that considerable emphasis be accorded to educational programs designed to keep practical and technical men alike fully informed as to the characteristics of the metals with which they have to work.

*Colasanti urges . . .*

## Greater appreciation of metallurgy

A NOTICEABLE industrial expansion in the trade area of which Denver is the center, has been taking place since World War II. This is in part a logical consequence of the expanded facilities, in being, created by the demands of war production. Some plants are industries which have been transplanted in Denver and vicinity after the war from other areas.

An awareness is growing among design engineers and tool makers in this area of the importance of alloying elements, both in tool steels and constructional steels. An example of the wider acceptance of alloys in tool steels is the preponderant use of a low tungsten-chromium oil hardening tool steel by a great majority of the local die makers, in preference to plain high carbon tool steel.

It is also clearly evident that the National Emergency steels of World War II contributed a permanent addition to the family of carburizing steels in the form of NE 8620, a steel with excellent hardenability and rather good machinability accompanied by only a moderate warping tendency in heat treating. Several manufacturing firms have standardized on this steel for their worm gears, bevel and spur gears and for automotive transmission parts.

Industry in the Denver area, as in many other areas, is seeking steels with properties as specified in the specifications of Government defense orders. The mounting scarcity of nickel as an alloying agent is leading to much improvisory substitution of plain carbon steels in peace time prod ucts and in defense item components of secondary importance. The ultimate resorting to NE steels again looms large as the indicated solution.

From my vantage point as a commercial heat treater it seems that many Western fabricators do not fully appreciate the potentialities of steel for meeting a variety of engineering applications, nor some of its limitations, primarily because they have not made a study of the fundamentals of iron and steel metallurgy. A comprehensive understanding of mechanical design must be accompanied by at least a moderate understanding of the behavior of metals and their alloys.

The Rocky Mountain Chapter of ASM sends greetings from the Denver area and best wishes for a successful Western Metals Show.

*Matthews praises . . .*

## "Practical metallurgy" lectures

THE GROWTH-TREND in metal fabrication in the Pacific Northwest can be attributed to two factors—increased population and the constant development of cheap electricity. The Westward trend in population has enlarged the home market, while providing a larger labor force. Each large manufacturer who builds a plant in the region to take advantage of these factors brings with him many satellite manufacturers, thus contributing to the growth of employment and market population.

Efficient mass production methods have not yet made a widespread appearance in the Northwest, although the trend is in that direction through the development of skilled supervisors, production engineers, metallurgists and craftsmen. Excellent training in the metals field is now available in the Northwest in colleges, universities and training programs similar to the "Practical Metallurgy" lecture series presently being sponsored by the Inland Empire chapter of the American Society for Metals in Spokane, Washington.

However, Northwest fabricators have yet to learn the advantages of hiring professionally skilled technical men in quality and quantity production. Newer equipment is also necessary in the Northwest to broaden manufacturing capabilities and to permit the acceptance of fabricating jobs now done elsewhere.

Furthermore, Northwest manufacturers have not yet realized the value of industrial research organizations such as the Washington State Industrial Research Division located at Pullman, Washington.

Aluminum is by far the leading metal of the Northwest, where it has provided the basis for fabrication of aircraft, truck bodies, truck castings, irrigation fittings, and fluorescent light fixtures used throughout the United States. Additional aluminum fabrication will depend upon the development of superior products for national distribution or upon adequate market population increases.

However, magnesium is the metal of growing interest to the transportation-conscious Northwest, and the demand is already present for a competent magnesium foundry to fabricate aircraft, truck, and trailer parts.

**Symposium Contributors:**

HARRY E. LEWIS
Chairman
Golden Gate Chapter
President, Pyromet Brazing & Heat Treating Co.
South San Francisco

ELTON B. CLARKE
Chairman, Oregon Chapter
Head Estimator
Willamette Iron & Steel Works
Portland

JAMES COLASANTI
Chairman
Rocky Mountain Chapter
Managing Owner, Metal Treating & Research Co., Denver

*Lewis foresees . . .*

## New forward strides in the West

WITH THE NATION launching an all out defense program, the metal industry of the West is about to take another large stride forward. Curtailment of metals for civilian uses will hold up the development of many new products, but the increased use of West Coast facilities and the addition of many new facilities for rearmament cannot but mean that the area will move forward again toward independence from the east in manufacturing.

There will no doubt be increased use of new alloys, but in the main, the old standbys will bear the greatest load of the rearmament program. I expect that the first new development of any size in the Bay Area will be the production of nodular iron. This material has great promise. We are now also hearing much about titanium. As knowledge of titanium is gained and becomes general, we can expect to find it processed on the West Coast.

Western manufacturers of metal products have always been ingenious, but many have used cut-and-try methods in determining the right metals to use or have used what is at hand.

There has been too much emphasis on the raw material cost and not enough on the overall cost, including processing.

There has been reliance on ingenuity instead of on technical knowledge (that is available in large quantities back East, but not so general here).

I believe that more use of broadly trained metallurgists must be the new order—that more attention to materials, processes and inspection will amply repay the added cost.

*Jackson perceives . . .*

## Broad expansion in titanium use

THE TRENDS in fabrication of metal products that I see in the West are that there will be a decrease of civilian metals produced, and an increase in Government-bought metal products. It is my belief that we are now in the middle of the transition period.

Metal fabrication in general will play a large part in our defense program.

New uses for metals that I foresee are aluminum in civilian housing, boat building and light weight automobiles.

Titanium shows such exceptional strength per unit weight at normal temperatures plus unmatched corrosion resistance that a broad expansion of its use in aircraft and marine fields appear certain.

Metals that seem to show the greatest promise to future development are aluminum, magnesium, titanium and SAE 4340 steel. I find that 4340 steel is used extensively in the aircraft industry.

Ductile chromium is a new development by the Bureau of Mines for use in manufacturing of instruments, radio tubes, etc.

New types of metals that industry is most likely to demand can be based on our common metals of today such as iron, aluminum, magnesium and titanium (the newcomer) will grow in relative consumption as compared with scarcer metals like copper, lead, zinc and mercury. There is also the emergence of the heavier metals, thorium, uranium, and plutonium.

I think the thing that Western fabricators most need to be educated on is proper substitutions of metals if shortages of metals occur.

# SIZE OF THE WESTERN METAL MARKET

### Western Consumption of Mill Shapes and Forms, Wire and Castings

| | Total, all steel establishments (fabricating and producing) | Total steel fabricating | STEEL FABRICATING ESTABLISHMENTS: CARBON STEEL: Bars and shapes | Sheet and strip | Structural shapes | Plates | Wire | All other mill shapes and forms | ALLOY STEEL: Bars and bar shapes | All other mill shapes and forms | STAINLESS STEEL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mountain | 349,943 | 172,023 | 40,478 | 30,488 | 26,914 | 38,005 | 3,107 | 28,051 | 2,602 | 2,106 | 272 |
| Montana | 6,954 | 6,954 | 738 | 3,587 | * | 1,769 | — | — | — | * | — |
| Idaho | 4,754 | 4,754 | 411 | * | * | * | — | — | — | — | — |
| Wyoming | * | * | * | * | * | * | — | — | — | — | * |
| Colorado | * | 80,005 | 26,588 | 20,698 | 8,033 | 16,777 | * | 1,697 | 1,936 | * | * |
| New Mexico | 1,905 | 1,905 | * | * | * | 567 | — | — | — | — | — |
| Arizona | * | 17,286 | * | * | 7,519 | * | * | 486 | * | — | * |
| Utah | 55,628 | 55,628 | 5,851 | 3,026 | 7,943 | 12,088 | — | 25,868 | * | — | * |
| Nevada | * | * | — | — | * | — | — | — | — | — | — |
| Pacific | 2,199,711 | 2,015,120 | 198,758 | 431,601 | 222,172 | 323,299 | 68,808 | 677,240 | 56,084 | 27,460 | 9,698 |
| Washington | * | 186,787 | 18,234 | 28,006 | 20,607 | 23,758 | * | 85,506 | 2,237 | * | 506 |
| Oregon | * | 130,486 | 15,921 | 22,131 | 12,674 | 35,049 | * | 40,647 | 2,785 | * | 242 |
| California | * | 1,697,847 | 164,603 | 381,464 | 188,891 | 264,492 | 61,441 | 551,087 | 51,062 | 25,857 | 8,950 |

| | Iron Castings, Rough and Semi-Finished: Purchased by Metal Fabricating Establishments | Iron Castings, Rough and Semi-Finished: Produced and consumed in the same establishment | Steel Castings, Rough and Semi-Finished: Purchased by Metal Fabricating Establishments | Steel Castings, Rough and Semi-Finished: Produced and consumed in the same establishment | Copper and Copper Base Alloy: Brass & Wire Mill Shapes & Forms: Metal Fabricating Establishments | Brass & Wire Mill Shapes & Forms: Metal Producing Establishments | Castings, Rough and Semi-Finished: Metal Fabricating Establishments | Castings, Rough and Semi-Finished: Metal Producing Establishments | Aluminum and Aluminum-Base Alloys: Mill Shapes: Metal Fabricating Establishments | Mill Shapes: Metal Producing Establishments | Castings, rough and Semi-Finished: Metal Fabricating Establishments | Castings, rough and Semi-Finished: Metal Producing Establishments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mountain | 4,082 | 51,555 | 6,205 | * | 902 | * | 325 | 33 | 1,325 | — | 221 | * |
| Colorado | 3,791 | 11,172 | 2,882 | | | | | | | | | |
| Pacific | 60,444 | 58,673 | 33,699 | 6,334 | 21,801 | * | 7,273 | 5,668 | 20,991 | — | 4,916 | 7,004 |
| Washington | 4,589 | * | 2,848 | 2,509 | * | — | 85 | — | 4,615 | | * | * |
| Oregon | 5,645 | * | 3,460 | — | * | — | 280 | * | 1,022 | — | * | * |
| California | 50,210 | 55,376 | 27,391 | 3,825 | 21,368 | * | 6,908 | 5,575 | 24,354 | — | 4,656 | 6,711 |
| Total West | 64,526 | 110,228 | 39,904 | 6,334 | 24,365 | | 7,598 | 5,701 | 31,316 | | 5,137 | 7,004 |

*Figures withheld to avoid disclosing individual operations. Figures in tons.

*(Source: U. S. Census of Manufacturers, 1947.)*

# Western Metal Congress Program
## Tailored to Western Industrial Needs

JUST AT A TIME when people need answers, and need them badly, to problems affecting all metal users and fabricators arising from the fact that we are entering a war economy, the opportunity to find many of these answers is provided. The opportunity is the Western Metal Congress and Exposition at Oakland, March 19-23, with programs and displays tailored to the emergency situation. • "Production for America" is the keynote of the event. • The affair is also directed specifically toward Western conditions, recognizing the fact that interest in the West is more in metal-working itself than in the abstractions of metallurgy. Two outstanding industries in the West have been singled out for special attention, aircraft and petroleum. Problems of small manufacturers are also to be given special treatment. • One of the most important sessions of the technical program will be a panel discussion around the table on the conservation and utilization of strategic and scarce materials and the employment of substitutes. Both ferrous and non-ferrous metals will be discussed, and the so-called "glamor metals" of the new era will be described together with their advantages and disadvantages. • Another round table will be devoted to mechanical failures, and will consider high and low temperature fractures, fatigue fractures, weld fractures, tool and die failures, and failures due to wear. A third round table will cover corrosion failures, including problems in the aircraft, oil and chemical industries. • A new feature will be the program on inspection, stressing the non-destructive methods now coming to the fore.

## AMERICAN SOCIETY FOR METALS

**MONDAY, MARCH 19—10:00 a.m.**

**Recent Developments in Materials and Methods for Aircraft Manufacture**

*Modern Trends in Airframe Materials in America*—LEO SCHAPIRO, Douglas Aircraft Co., Inc., Santa Monica

*The Effect of Airframe Design Trends on Manufacturing Methods and Processes*—ALFRED H. PETERSON, Prod. Design Engr., Lockheed Aircraft Corp., Burbank

**MONDAY, MARCH 19— 2:00 p.m.**

*Joining and Assembly Techniques*—T. E. PIPER, Ch. of Materials & Process Engr., Northrop Aircraft, Inc., Hawthorne

*Selection of Materials for Jet Engines*—ARTHUR W. F. GREEN, Ch. Mat., Allison Div., General Motors Corp., Indianapolis.

*Stainless Steel for Aircraft*—ROBERT A. SMITH, Met., WILLARD H. WYNNE, Ch. Process Engr., and BERNARD GROSS, Dir. of Labs., Rohr Aircraft Corp., Chula Vista.

**TUESDAY, MARCH 20—10:00 a.m.—*Seminar on Service Failures***

COORDINATOR—JOHN E. DORN, Prof., Met. Eng., University of Calif.

SUBJECTS FOR DISCUSSION—"High Temperature Fractures"; "Low Temperature Fractures"; "Fatigue Fractures"; "Weld Fractures"; "Tool & Die Failures"; "Failures Due to Wear".

SPEAKERS—ALEX FINLASON, Ch. Met., Pacific Car & Foundry Co., Renton; ARTHUR E. FOOKE, Ch. Met., Diamond Chain Co., Inc., Indianapolis; ARTHUR W. F. GREEN, Ch. Met., Allison Div., General Motors Corp., Indianapolis; WALTER E. JOMINY, Staff Engr., Chrysler Corp., Detroit; HARRY E. KENNEDY, Cons. Engr., Berkeley, J. T. LEYDEN, Crucible Steel Co., Sanderson-Halcomb Works, Syracuse.

**TUESDAY, MARCH 20—2:00 p.m.—*Round Table Discussion of Corrosion Failures***

COORDINATOR—GEORGE A. NELSON, Met., Shell Development Co., Emeryville.

SUBJECTS FOR DISCUSSION—"General Corrosion"; "Stress Corrosion"; "Corrosion Fatigue"; "Problems in Aircraft Industry"; "Problems in Oil and Chemical Industry".

SPEAKERS—ROBERT T. EFFINGER, Refining Engr., Shell Oil Co., Martinez; SAM HOYT, Battelle Memorial Institute, Columbus; T. E. PIPER, Ch. Materials & Process Engr., Northrop Aircraft, Inc., Santa Monica; DANA SMITH, Kaiser Aluminum & Chemical Corp., Spokane; JAMES T. WABER, Staff-Member, Chemistry-Met. Div., Los Alamos Scientific Lab., Los Alamos.

**WEDNESDAY, MARCH 21—10:00 a.m.—*Panel Discussion on Conservation, Utilization and Substitution for Strategic and Scarce Materials***

**NONFERROUS METALS**

MODERATOR—ERNEST E. THUM, Editor, *Metal Progress.*

SUBJECTS FOR DISCUSSION—"Copper—Zinc, Tin, Lead and Their Alloys"; "Light Metals—Aluminum, Magnesium, Titanium"; "Nickel and Chromium and Their Alloys"; "Stainless and Heat Resisting Steels"; "New and Rarer Metals".

## AMERICAN SOCIETY FOR METALS *(Continued)*

PANEL MEMBERS—E. H. Weaver, Union Oil Co., San Francisco; J. D. Hanawalt, Dow Chemical Co., Midland; Ralph L. Wilson, Timken Roller Bearing Co., Canton; W. L. Finlay, Rem-Cru Titanium, Inc., Bridgeport; Paul Ziegler, Kaiser Aluminum & Chemical Co., Spokane.

**WEDNESDAY, MARCH 21—2:00 p.m.—*Panel Discussion on Conservation, Utilization and Substitution for Strategic and Scarce Materials***

### ALLOY STEELS

MODERATOR—Ernest E. Thum, Editor *Metal Progress.*

SUBJECTS FOR DISCUSSION—"Iron and Steel Supplies"; "Conservation of Critical Alloys"; "Use and Heat Treatment of Alloy Steels with Minimum Alloy"; "Selecting Low Alloy Steels by Their Hardenability"; "Toolsteels and Tool Materials".

PANEL MEMBERS—James B. Austin, U. S. Steel Corp., Kearny; Elmer Gammeter, Globe Steel Tube Co., Milwaukee; John Chipman, Massachusetts Institute of Technology, Cambridge; Thomas G. Digges, National Bureau of Standards, Washington; Walter E. Jominy, Chrysler Corp., Detroit; Fred J. Robbins, Plomb Tool Co., Los Angeles.

**THURSDAY, MARCH 22—10:00 a.m.—*Western Metals Business Forum***

**THURSDAY, MARCH 22—2:00 p.m.—*Metallurgical Problems of the Small Manufacturer***

"Selection of Materials for Manufacturing of Small Equipment"—Reno R. Cole, Ch. Met. and Mgr. of Methods and Standards Dept., Friden Calculating Machine Co., San Leandro.

"Reducing Wear by Proper Metallurgy"—Walter E. Jominy, Staff Engr., Chrysler Corp., Detroit.

"Casting Potentials to Replace Forgings"—H. H. Harris, Pres., General Alloys Co., Boston.

**FRIDAY, MARCH 23—10:00 a.m.—*Metallurgical Problems in the Oil Industry***

"Engineering Consideration Governing Selection of Materials"—K. V. King, Standard Oil of California, San Francisco.

"Progress in Process Constructional Materials"—George A. Nelson, Shell Development Co., Emeryville.

"Trends in the Development of Special Alloys Applicable to the Oil Industry"—Ralph L. Wilson, Dir. of Res., Timken Roller Bearing Co., Steel & Tube Div., Canton.

# AMERICAN WELDING SOCIETY

**MONDAY, MARCH 19, 1951**

10:00-11:00 a.m. *Bridge Structural Welding*.....L. C. Hollister, Bridge Engineer
Division California State Highways

11:00-12:00 a.m. *Structural Welding*.....La Motte Grover, Welding Engineer
Air Reduction Sales Company

12:15- 1:30 p.m. American Welding Society Official Convention Luncheon

2:00- 3:00 p.m. *"Kaiser Steel 14" Electric Weld Process*.....R. G. Reigel, Supt. of Electric Welded Pipe
Kaiser Steel Corporation

3:00- 4:00 p.m. *Recent Developments in Brazing and Welding of Copper*....James P. Kemp, Metallurgical Engr.
American Brass Company

**TUESDAY, MARCH 20, 1951**

10:00-11:00 a.m. *The Welding and Metallurgical Phase of Large Diameter High Strength Cold Worked Pipe and Some Interesting Notes Relative to its Testing*.....W. A. Saylor, Metallurgist
Consolidated Western Steel Corp.

11:00-12:00 a.m. *Recent Developments in Flame Cutting*.....T. T. Parker, Supt. of Specialty Mfg.,
Kaiser Steel Corporation

2:00- 3:00 p.m. *Conserving Industrial Resources with Automatic Hard Facing and Surface Build-up*.....T. R. Brashear, Supt. of Automatic Welding
Leader Welding & Mfg. Co.

3:00- 4:00 p.m. *Shielded and Submerged Arc Welding in the Centrifugal Pump and Oil Tool Industry*.....F. R. Drahos, Metallurgist
Byron Jackson Company

4:00- 5:30 p.m. *Applied Welding Engineering*.....Prof. Gilbert S. Schaller, Prof. of Mechanical Engineering
University of Washington

**WEDNESDAY, MARCH 21, 1951**

10:00-11:00 a.m. *Welding Jet Component Parts*.....G. L. Richardson, *Manager Product Service*
General Electric Company

11:00-12:00 a.m. *Semi-Automatic Inert-Gas Metal Arc Welding*.....L. Robbins, Welding Engineer
Mare Island Naval Shipyard

2:00- 3:00 p.m. *Fundamentals of Inert-Gas Shielded Arc Welding*
H. E. Rockefeller, Asst. Manager of Development & Process Service
Linde Air Products Div., Union Carbide & Carbon Corporation

## AMERICAN WELDING SOCIETY (Continued)

3:00- 4:00 p.m. *The Role of Aircomatic Welding in a Defense Production Economy*..... .....J. H. BERRYMAN
Air Reduction Pacific Company

4:00- 5:00 p.m. *Welding of Stainless Steels and Its Effect on Corrosion Resistance*.....E. W. HOPPER
Crucible Steel Company

**THURSDAY, MARCH 22, 1951—Western Metals Business Forum**

2:00- 3:00 p.m. *Flash Welding of Mild Steel and High Strength Alloys for High Speed Production*..... .....CHAS. SMITH, Engineer
Douglas Aircraft Company

3:00- 4:00 p.m. *Quality Control of Structural Resistance Welding in Aircraft* .....J. R. FULLERTON, Welding Engineer
Ryan Aircraft Company

4:00- 5:00 p.m. Movie—*This is Resistance Welding*—General Electric Company

**FRIDAY, MARCH 23, 1951**

9:00-10:00 a.m. *Progress Report on Welding Processes*.....T. B. JEFFERSON, Editor *The Welding Engineer*

10:00-11:00 a.m. *Should Welding Be on Its Own in Education*.....PROFESSOR R. C. WILEY
California State Polytechnic College

11:00-12:00 a.m. Open Discussion—Subject: *Education of the Welding Engineer*

# NON-DESTRUCTIVE TESTING SOCIETY

### SYMPOSIUM ON FORGINGS AND MACHINE PARTS INSPECTION

**MARCH 19th—2:00 p.m.**

*Penetrant Methods*..... ..... ..... .....J. L. BARKER, Asst. Foreman, Receiving Inspection
Douglas Aircraft Co., Santa Monica, Calif.

*Magnetic Particle*.....C. GIEST, Manager, Receiving Inspection
Lockheed Aircraft Corp., Burbank, Calif.

**MARCH 19th—8:00 p.m.**

*Ultrasonic Inspection*..... ..... .....D. C. ERDMAN, President
Electrocircuits Co., Pasadena, Calif.

*What Management Expects of the Inspection Department*.....H. O. WILLIAMS, Chief Inspector
Douglas Aircraft Co., Santa Monica, Calif.

### SYMPOSIUM ON WELDMENT INSPECTION

**MARCH 20th—2:00 p.m.**

*Aircraft Construction*.....J. W. SWEET, Chief Metallurgist
Boeing Airplane Co., Seattle, Wash.

*Steel Plate Fabrication Inspection*.....D. CHRISTOFFERSON, Welding Engineer
Chicago Bridge & Iron Co., Salt Lake City, Utah

### SYMPOSIUM ON FERROUS CASTING INSPECTION

**MARCH 20th—8:00 p.m.**

*Radiography of Ferrous Castings*.....R. F. HOLSTE, Manager, Industrial X-Ray Section
General Electric X-Ray Corp., Milwaukee, Wis.

*Magnetic Inspection of Ferrous Castings*.....W. J. ERICHSEN, Ch. Met.
Westinghouse Electric Corp., Sunnyvale, Calif.

### SYMPOSIUM ON MAINTENANCE INSPECTION

**MARCH 21st—2:00 p.m.**

*Aircraft Maintenance Inspection*.....W. WILCOX, Director of Quality
United Air Lines, San Francisco, Calif.

*Railway Maintenance Inspection*..... .....A. S. PEDRICK, Asst. Engineer of Tests
Southern Pacific Co., San Francisco, Calif.

### SYMPOSIUM ON INSPECTION OF NON FERROUS CASTINGS

**MARCH 21st—8:00 p.m.**

*Radiography of Non Ferrous Castings*..... .....J. SCHNEEMAN, President
X-Ray Products, Los Angeles, Calif.

*Fluorescent Penetrant of Non Ferrous Castings*.....L. M. NASH, Chief Metallurgist
Magnesium Alloy Products, Los Angeles, Calif.

# AMERICAN FOUNDRYMEN'S SOCIETY

**TUESDAY, MARCH 20—8:00 p.m.**

*Insulation and Solidification of Risers with the Use of Mineral Perlite*.....EDWARD D. BOYLE
Puget Sound Naval Shipyard, Bremerton, Wash.

**WEDNESDAY, MARCH 21—8:00 p.m.**

*Basic Cupola* and *Nodular Iron*.....JAMES T. MACKENZIE, Technical Director
American Cast Iron Pipe Co., Birmingham

# GEIGER COUNTERS FOR WEAR TESTING

By
WALTER W. OFFNER
X-Ray Engineering Co.
San Francisco, Calif.
Registered Professional Engineer

**Accuracy far exceeds micrometer; automotive parts can be tested by this method without disassembling the engine, and for $43 month AEC will irradiate about four piston rings**

RADIOACTIVE materials have this year become as important and as widely useful to industry as nuts and bolts. What started out as a frightening phenomenon of this atomic age has developed into a functional tool that has so many far-reaching possibilities and potential industrial benefits that the most astute scientists have but scratched the surface of application.

Wear-testing of metal parts, for example, can be conducted (1) much faster, (2) much more accurately, and (3) with far less bother than was ever possible heretofore.

### Effect of Friction and Lubricants

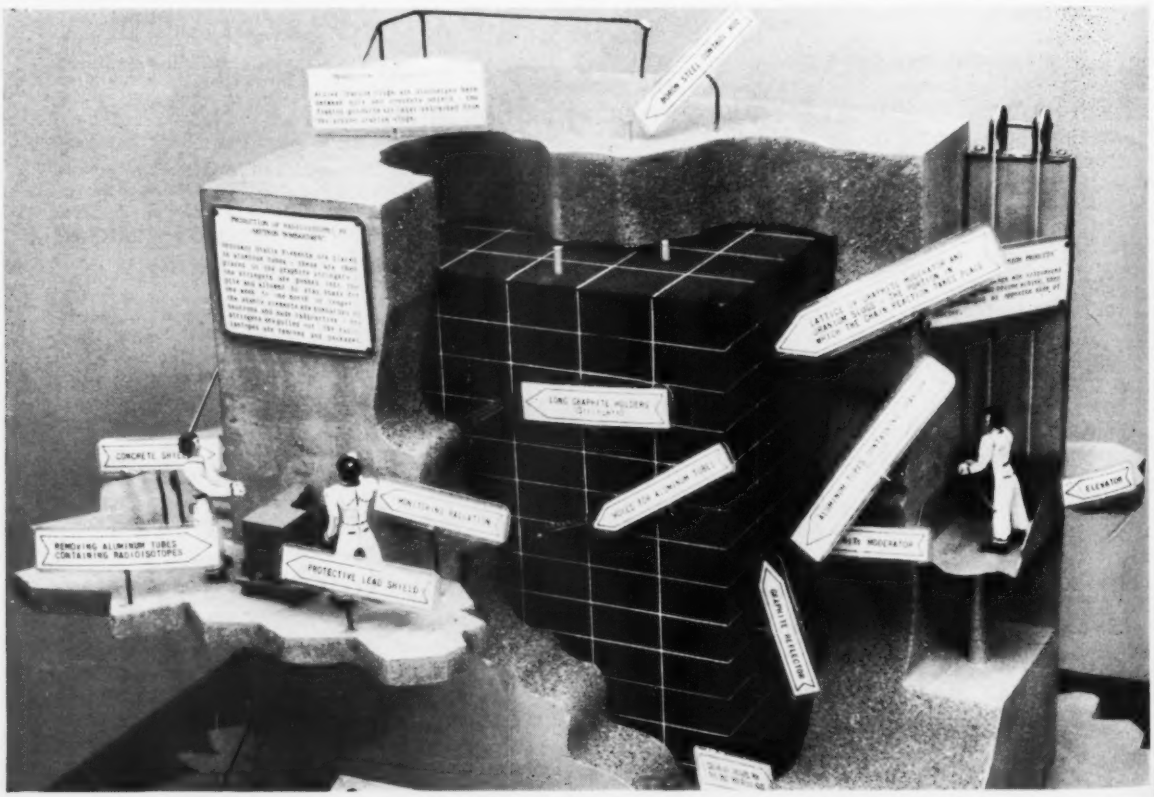
Automotive parts, such as piston rings, pistons, cylinder sleeves, etc., can be made radioactive to study wear through (1) friction and (2) the action and decomposition of lubricants. And engines do not now have to be torn down to measure that wear. Continuous tests are possible, without disassembling the engine or removing any parts.

Microscopic particles of the part being measured for wear, rub off during normal operation of that part, and those microscopic particles drop into the crankcase. At given intervals, a Geiger counter can indicate the amount of radiation from those particles, thereby determining the amount of material that has worn off the part being tested.

Accuracy of this new system far exceeds the older method of measuring wear by micrometer. Accuracy of measuring wear in radioactive parts is beyond today's practical limits.

In theory, if the lubricating oil is of ideal quality, it will provide a thin film of lubricant on all surfaces subject to friction. The poorer the quality

**Model of an atomic pile. Insert ordinary stable elements in aluminum tubes, place them in graphite pile, where neutrons bombard stable elements, make them radioactive. Week to month or later, remove the stringers and package the radioisotopes.**



of oil, the faster it will decompose under operating conditions.

When that decomposition occurs (in a properly designed engine) the lubricating oil cannot provide that necessary film, and a metal-to-metal contact results that wears off small particles of metal.

These machine parts under wear investigation are made radioactive by irradiation in an atomic pile. There they absorb neutrons and change the stable iron 58 to the unstable, heavier, and radioactive iron 59. The amount of radioactivity induced depends upon the period of irradiation.

### Cost Not Too Expensive

This type of industrial research is not too expensive to the user of radioactive materials. For example, to irradiate about four piston rings, the Atomic Energy Commission charges $43.00 per month (long enough for the rings) of radiation, plus about $10.00 for handling charges.

Main expense is in freight charges, since a lead shipping container must be used to enclose the parts from the AEC plant to the testing location. Radioactive isotopes (forms of the same chemical element but having different atomic weights) are made by:

1. Neutron bombardment in the atomic pile.

2. Bombardment with deutrons, protons, alpha-beta-gamma rays in the cyclotron. All radioisotopes throw off rays or particles. These emissions give them their special value.

Materials under laboratory investigation are made radioactive by absorbing neutrons, rendering the atoms unstable. Most radioactive tracer work (such as just described in the automotive engine) is done in pure, applied and industrial research. Much practical application is developed from these activities, and uses for radioactive materials are steadily increasing.

### Radioactive Tracer Work

Radioactive tracer work is done by (1) making the part under investigation radioactive, or (2) attaching a radioactive material to the part under investigation. In either case, the amount of radiation is detected with a Geiger counter.

Radioactive tracers have been used to study iron diffusion and disposition of welding rods and coating. Such tracers have been used to determine the desulphurization of coal during coking. Radioactive tracers have been used extensively in the pipeline business, to (1) locate lost scrapers, and (2) determine the beginning and end of a liquid being pumped through the pipe.

Radioactive material is being used to measure the fluid level in closed tanks, including the liquid metal level in foundry cupolas. Water repellant and grease resistant compounds in fabrics can be tested and checked for even distribution with radioactive hydrocarbon 14.

### Put To Various Uses

Since carbon has a more profound effect on the mechanical properties of steel than any other element, radiocarbon 14 is being used to study the distribution of carbon in steel, its segregation habits, and the mechanism by which it causes steel to harden.

Studies are in progress to determine the method of changes in metal during heat treatment. Other studies enter upon the diffusion of solid iron during annealing, hardening, and recrystallization.

Radioactive materials are assisting science to determine what happens to metal in high-speed ball bearings.

Research with these materials is centering around the solubility of calcium in liquid iron, the ionic properties of slags, the method of formation of scale, and the segregation of tungsten in high temperature materials.

Thickness of pipe walls is measured while the pipe is in service.

Condenser water flow is measured with these materials. Sewage dispersion is checked. The glass industry can check thermal diffusion of sodium in the glass.

California Institute of Technology at Pasadena is now using radiation to bring about chromosome translocation to reduce time and labor in hybrid corn breeding. Radioactive iodine and radioactive phosphorus play an important part in medical research.

These are only a few of the many uses for radioactive isotopes in industry. Technical men say they are one of the most useful tools devised since the invention of the microscope.

Reasonable care should be exerted, when handling radioactive materials. If sufficient care is taken, there is no danger. Ordinary safety precautions, plus particular applications to the type of material being handled, are enough.

Actually, these radioactive materials are no more dangerous to handle than dynamite, for example, or any other such substance. About 80% of all dire predictions by scientists at the time of the atom bomb have now proven to be a bit strong. Most of the actual damage resulted from shock wave and heat. Radiation damage was comparatively small.

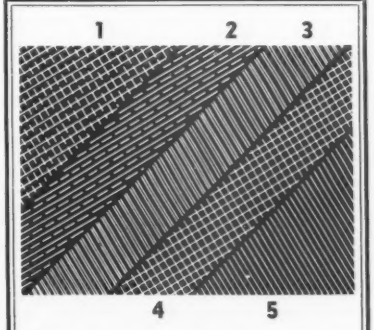
## Magnesium Alloys Become Popular With Foundries

MAGNESIUM ALLOYS containing cerium and zirconium for elevated temperatures are the newest metallurgical development.

Quite recently, grey iron foundries have been working with magnesium-containing alloys as addition agents to the ladle, just prior to pouring a casting. Result is that the graphite particles become nodular, and properties of the cast iron are greatly improved.

Special magnesium alloys can be made up for chemical and metallurgical uses. Among these are alloys for deoxidizing, degassing, or alloying with nonferrous metals such as aluminum, nickel, brass, bronze, zinc, and copper.

Magnesium is the world's lightest structural material. It has a specific gravity of 1.74. Aluminum is 1½ times heavier than magnesium, iron and steel are four times heavier, and copper and nickel alloys are five times heavier. Magnesium can be cast and worked by practically every method known. It can be heat treated to further remove impurities. It has good stability to atmospheric exposure, resistance to attack by alkalis, chromic and hydrofluoric acids, and many organic chemicals.




**Just in case you happened to be puzzled** by the background of the panel on the front cover, the markings are the symbols for various metals adopted by the American Standards Association for use on drawings and blueprints.

The symbols as numbered above mean as follows:

1. Magnesium, aluminum and aluminum alloys
2. Bronze, brass, copper and compositions
3. Steel
4. White metal, zinc, lead, babbitt and alloys
5. Cast iron

# TRENDS IN TOOLS, WELDING

**Plastics have many advantages over metals in tooling; thick and strong layers of metal or alloys plated by new method; fusion welding entirely by pressure; quality control grows**

PLASTICS are being used more and more extensively, not only for light weight aircraft parts, but also as a material for limited production and experimental type tooling. Their advantages in tooling are:

1. Their lightness as compared to equally strong or rigid metallic tools.
2. The simplicity of producing plastic tools.
3. The comparatively short labor and shop time involved in plastic tool production.
4. The comparative low cost of plastic tools for many applications.
5. Their stability and strength, that is, their great resistance to dimensional changes.
6. The fact that *excessive* abuse is readily detectable (e.g., a plastic template if dropped will not bend or distort without noticeable surface dimension changes).

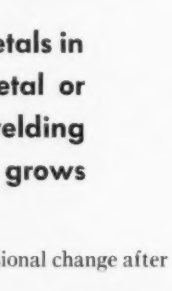
A good example of their strength, rigidity and resistance to impact was shown several years ago in an issue of *Life* magazine; you may have seen it. A photo showed a hefty individual giving a laminated plastic fender the old one-two with a 16-lb. sledge hammer. The fender showed no evidence of damage or dimensional change after this treatment.

A disadvantage of some types of plastic tools is that they are more easily abraded than metal. This can be compensated for by metallic facings of thin sheet metal on areas subject to great wear.

By

**T. E. PIPER**

Chief Materials and Process Engineer
Northrop Aircraft, Inc.
Hawthorne, Calif.



In a strut fairing made from laminated glass fiber cloth plastics, with drill and trim templates made by the same process, the tool is produced by laying glass fiber cloth over a part or die, impregnating each layer of glass fiber cloth with a polyester resin, covering with a pressure bag when necessary, and allowing it to air harden. The cold method of curing is used more extensively at Northrop than heat curing methods, so as to prevent warpage during curing.

After curing the laminated glass fiber plastic template is removed, drill bushings attached for drilling, edges cut to the desired trim line, and metal facings added, if necessary. This type of laminated glass fiber plastic is now being used also for assembly trim and drill templates and welding fixtures, and new uses will no doubt be found by extension of its current use.

Contoured dies shown of thermosetting cast phenolic resin are used for fabricating plastic parts. This same type material and same method of making a die may be used to produce pin rotor jigs, holding fixtures, mill fixtures, duplicating masters, matrix molds for electroform process, post-forming dies, trim and drill fixtures, stretch press dies, duplicating patterns, etc.

Mechanical properties of dies produced in the order of: 5,000 to 9,000 psi. U.T.S.; 14,000 to 20,000 psi. U. C.S.; 5,000 to 7,000 psi. shear strength can be obtained. From this brief description it can be seen that we have a very versatile tooling material capable of further "use" expansion. Costwise, plastic type dies are desirable in many applications.

### Magnesium Reduces Warpage

Use of magnesium for jigs and fixtures in the welding of aluminum and magnesium parts has reduced warpage problems considerably. Steel jigs and fixtures were standard for years. However, when welding aluminum and magnesium in these steel jigs a certain amount of warpage of the parts occurred, caused by the difference in thermal expansion between the steel jigs and the aluminum or magnesium part during preheating and welding. The result is that the parts are under compression stress in areas held by steel jigs, and if the stress is severe enough permanent deformation occurs.

Currently magnesium is replacing steel in welding jigs and fixtures. Steel is used only in restricted areas to give the strength, rigidity and stability against jig warpage. As a result, warpage problems have been greatly reduced and the general utility of aluminum and magnesium welded parts increased.

In connection with warpage it might also be asked, "What can be done about eliminating warpage during the

**Simplicity and Less Shop Time of Plastic Die Apparent**

(Die making steps generalized as much as possible to allow for variations in procedure.)

| THERMOSETTING DIE<br>FABRICATION PROCEDURE | ZINC ALLOY DIE<br>FABRICATION PROCEDURE |
|---|---|
| 1. Make plaster splash from "mock-up." | 1. Make a plaster splash from "mock-up." |
| 2. Apply sealing compound and releasing agent (e.g., silicone grease) to surface of splash. | 2. Make plaster pattern from splash. |
| 3. Pour in casting resin. Let set at room temperature for 8 hours. | 3. Make sand mold using plaster pattern. |
| 4. Bake at 180° F. for 8 hours. | 4. Cast in zinc alloy. |
| | 5. Finish grind surface to fit blue block. |
| Manhours ..... 8 | Manhours ..... 24 |
| Total time (hours) ..... 24 | Total time (hours) ..... 48 |

strain relieving treatment which is given every aluminum and magnesium welded part?" Warpage is prevented during strain-relieving at Northrop by leaving the welded parts in their jigs during the strain-relieving heat treatment, whenever possible.

Another question is, "Why is magnesium and not aluminum used in welding fixtures and jigs?" The primary reason is that magnesium is easier and less costly to fabricate. Also the expansion characteristics of aluminum and magnesium are very similar, thus allowing the use of magnesium fixtures and jigs in the welding of both aluminum and magnesium parts.

### Electroform Method

Another tool and recent North American development for fabrication of plastic aircraft parts is the Electroform method, essentially a process for plating thick and strong layers of metals or alloys. The application illustrated is a strong, internally heated, light weight, low mass, high thermal conductivity die, consisting of a thick plate of nickel or Ni and Cu to give the thermal conductivity.

The plating is done directly over a phenolic cast resin pattern (matrix) which is covered with a suitable conductively adherent film to allow uniform plating. After plating to a thickness to give the desired strength, the slat is removed from the plastic pattern, reinforcing members to give it the desired rigidity welded to the back of the plate, copper tubing coiled flat against the back of plate, metal spray used to attach and give good thermal conductivity between tubes and plate, and the die is then essentially ready for use.

This method can be used to fabricate plastic parts of the same kind and type as can be formed on phenolic cast resin dies. The difference in use of the two lies in the number of plastic parts to be fabricated. The cast phenolic resin dies require a longer fabricating cycle than Electroform dies. The die cost for the cast phenolic dies, however, is much less than for the Electroform dies.

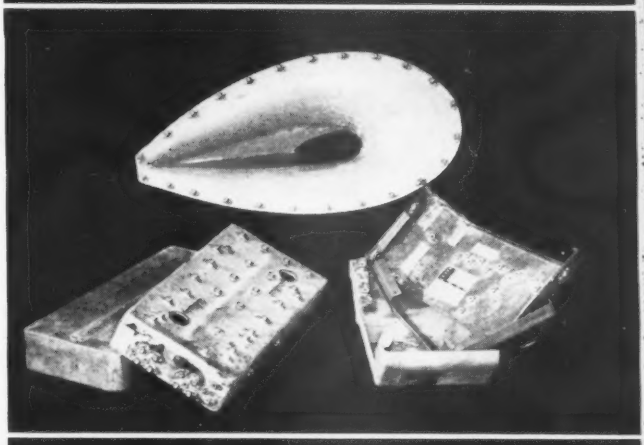
Therefore, the cast phenolic resin dies are of the greatest advantage for experimental and short production runs of a given part (up to about a 50 part run). When the total quantity of a given production part is large, i.e., 500-1,000, then the Electroform may be applicable, since the cost of the die when depreciated over a large number of parts is small as compared to fabrication time and cost savings obtained.

Another recent forming tool development of the trend in limited production tools, i.e., adaptable to comparatively short runs of parts with a rapid conversion from production of one part to another, is the flexible stretch form block for contour forming of extrusions and preformed sheet or plate sections of similar shapes. In its present stage of development this method is particularly adapted and is being used almost exclusively to form contours common to the wing and empennage curve or to the longitudinal curve of the fuselage.

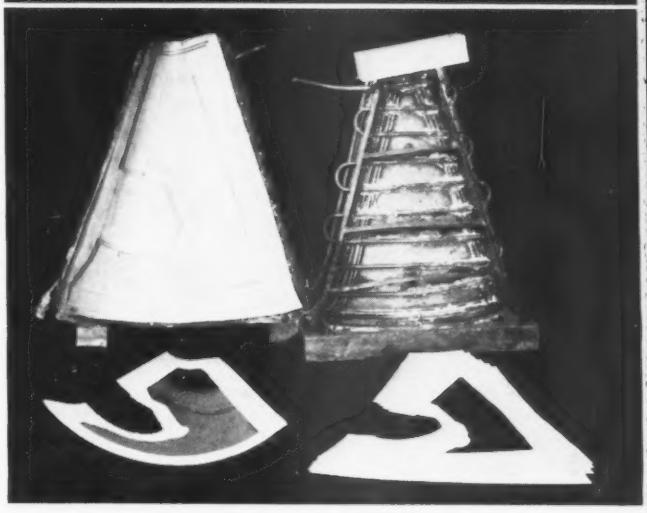
Previously a stretch form block of Masonite, aluminum alloys or Zn alloy was required for each individual part to be formed. With the current method one flexible cavity snake is required for each shape and size of extrusion or formed section, but can be used over and over again for any contour of part with a radius of 50 in. or over.

This snake is cast from cerro-matrix (low melting alloy) in one section using a straight length of the actual extrusion or formed section during casting to produce the desired cavity. This long casting is then cut into segments sufficiently short to produce the desired contour within the tolerances

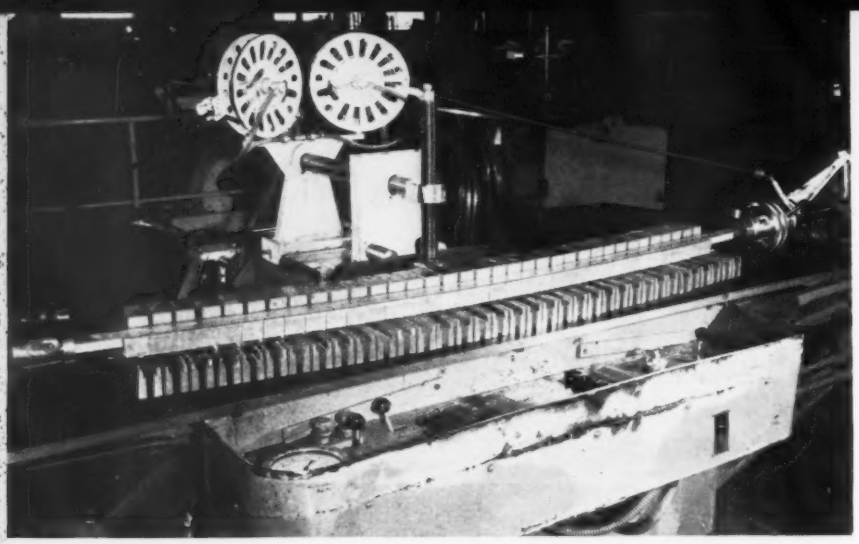
**These contoured dies of thermosetting cast phenolic resin are utilized for fabricating plastic airplane parts.**



**Actual parts of strut fairing of laminated glass plastics, partially nested in trim templates made by the same process, reveals relationship between them.**



**Electroform type of light weight and low mass internally-heated high conductivity contour die for plating layers of metal.**



**Flexible stretch form block developed at Northrop for contour forming extrusions for Scorpion F-89 all-weather interceptor, and preformed sheet or plate sections.**

required. For example a 2-in. segment will produce contour of radii 100 inches or greater within ± .005 of the desired contour. Before use the segments are connected to each other by two long coil springs to permit the desired flexibility and ease of handling.

In addition, one set of adjustable angle blocks and one base plate for all extrusions and formed sections of 2 in. area or less are needed to complete the tooling.

In practice the adjustable angle blocks are adjusted to the desired length and contour with a suitable template, the flexible snake positioned (with the cavity up or outward, depending on plane of contour required with respect to extrusion cross-sectional shape), the straight extrusion or formed section placed in cavity of flexible snake and gripped by the stretch jaws and then the forming cycle started.

### Fusion Welding

Progress and advancement of fusion welding processes has been more rapid since 1946 than the previous years of the welding industry. Some of the development work was instigated during the war, but expanded and broadened in use since that time. This is clearly shown for the Heliarc process, which has made possible the welding of practically all alloys and employed in hundreds of industries.

At the same time various other welding processes have been developed from the original idea. The most recent developments of this nature are the Heliarc spot welder and the continuous wire feed Heliarc process.

Another very important development has been the introduction of low hydrogen type electrodes for welding steels of higher hardenability and steel with chemical and physical variations from the mills. It is also applicable to high sulphur bearing steels and has become of increasing value where it is desirable to eliminate preheat or employ a low local preheat.

A new joining process has been introduced which requires no heat but is welded and produces fusion entirely through pressure. This process is employed to weld aluminum to aluminum and aluminum to copper. It is applicable for thin aluminum sheets .010 and less and for electrical contacts or conductors. Commercial copper, beryllium copper, brass, silver, aluminum, lead, nickel, and Monel can be pressure welded to each other.

### Spot Welding

From the time that spot welding was first employed as a means of joining metal parts in the manufacture of aircraft, process control of weld quality has been a factor of the greatest importance. Welding engineers have always been aware of this and in recent years have done a great deal in improving welding machine performance, adjustment technique, material cleaning processes, personnel training, etc. At the present time spot welding in the aircraft industry is pretty well established.

Some design engineers, however, seem to lack confidence in this method and prefer to use mechanical attachments where spot welding would be advantageous. For the benefit of these people, as well as the Inspection Departments and Process Engineering, a system of statistical analysis of weld quality has been set up that has worked out very well.

This system of quality control can best be explained by tracing through a typical example. When a new weld application is brought to the welding department to become a regular production item, it is immediately examined by the department supervisor and the welding engineer to determine which machine or machines are best suited to the welding job.

After this has been decided, a welding schedule is set up and a group of 35 standard type single spot weld shear specimens are made. The weld material for these specimens is arranged so as to correspond exactly in thickness, alloy type and condition of heat treat, to that of the weld application. The weld machine control dial settings as used are all accurately recorded on a form provided for this purpose.

### Process Control Chart

Five of these specimens are selected at random, cross-sectioned through the center of the weld, polished, etched and metallurgically analyzed. The remaining 30 specimens are individually tested to their ultimate shear strength.

The values thus obtained are recorded on the Process Control Chart and are averaged, first in groups of three, and these results averaged to give a general average for the ten groups. This general average value is checked against a table of "Minimum Average Strength Values Acceptable." If satisfactory, the figure is "rounded off" to the nearest zero, and the strength spread range determined from the "10% Tables Rounded" column.

These levels are established on the Process Control Chart, the averages in blue and the limiting boundaries in red. The shear strength values of the 30 welds tested (each figure represents an average of three welds) are now plotted on the Process Control Chart.

The Process Control Charts are signed off by the Process Engineering representative and the schedule is immediately available for production use.

During production, the machine operator is required to keep his machine adjusted in all respects as called for on the machine adjustment schedule, and he is further required to make and furnish the inspection department with three shear test specimens at thirty-minute intervals.

The inspector will test the specimens, note their values on the Process Control Chart, average them and plot the average value. As long as the tests show that welds of the desired strength are being obtained, and are passable in all other respects, the operator continues in production. When the test shows a value not conforming with the established Control Chart limitations, then the work is stopped immediately until the cause can be determined and corrections made.

*Concluded on page 80*

# REPLACES "LOST WAX"

## Plastic patterns now make precision investment castings cheaply, in quantity

By R. J. NEILL
District Manager
Haynes Stellite Division, Union Carbide and Carbon Corporation
San Francisco, Calif.

PRECISION investment castings have been made industrially for years, by the "lost wax" process. Now, by a switch from wax to plastic patterns, these benefits result:

1. Castings (in quantity) are cheaper.
2. Finishing costs are cut considerably.
3. Desirable design features (such as thin edges, fillets, and integral casting) can be used freely.
4. Plastic dies have longer injection life.
5. More uniform and accurate patterns are produced.
6. Injection cost (wax vs. plastic into the dies) is less.
7. Patterns themselves can be machined as desired, and directly reproduced.

Costs are coming down on more and more industrial applications of precision investment castings as a result of economies now made possible on large-quantity runs by use of plastic rather than wax. These economies result from development of new production techniques with plastic, as well as from use of the new material itself.

Designers have discovered that even large quantities of intricate parts can be cast from alloys that resist the most severe operating conditions, without regard to machinability.

Finishing costs are cut because parts can be investment-cast to tolerances that were formerly unheard of in conventional castings.

### Can Re-use Plastics

Disposable patterns used in investment casting were originally all made from wax. Casting sprues, also made of wax, were attached. The whole was then invested in plaster.

The investment was then allowed to set. When completely hardened, it was carefully heated. Heat melted the wax, finally burning out all traces of it. Into the cavity thus formed, metal was cast. That metal became, after cooling, a reproduction in metal of the wax pattern.

Once used as a pattern, the wax was not recovered for re-use: hence, the term "lost wax." A wax pattern must be handled carefully, since a slight change of temperature (from manual handling) might alter its dimensions.

Now, however, the patterns that are used on large quantity runs are made from thermoplastic resins. Plastic used can be recovered and reused.

On shapes that are relatively easy to sink, the cost of plastic injection dies is comparable to the cost of the master patterns and soft metal dies that are used for making wax patterns.

On more intricate shapes, plastic dies cost proportionately more and are also more difficult to repair when design changes are made. However, they compensate for that by having longer injection life, and by producing more uniform and accurate patterns. Another benefit is the lower cost involved for injecting plastic instead of wax into the dies.

For small-volume runs, wax patterns are doubtless cheaper. Wax pattern dies are less expensive to make. A production run of 5,000 to 10,000 pieces, however, will probably offset the higher cost of a plastic injection die. Production runs in excess of that amount will result in definite savings.

### Keep Plastics in Mind

Plastic patterns are to be considered when (1) the production quantities are high, and (2) design of the casting is stabilized.

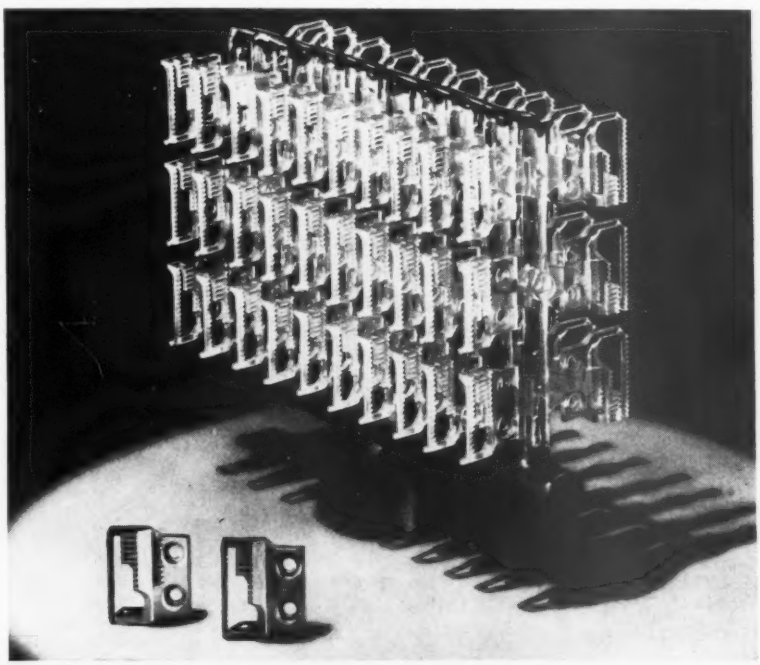
It has been pointed out that repair of plastic injection dies is difficult and expensive. For that reason, any elaborate tooling for quantity production should never be started until both the best alloy and the best design for a particular application have been determined.

When either the alloy or the design is in question, test patterns can be made by machining both patterns and sprues directly in plastic and then mounting them individually for casting.

With wax patterns such action cannot be taken. Dies must be made for even trial runs.

For best results, engineers should design the parts with investment-casting in mind. Only then can they take full advantage of all this new process has to offer.

**Dimensions and tolerances are held to exceedingly close limits. Finishing operations (cutting to size) practically eliminated. Here are shown plastic molds for 60 sewing machine feed dogs, ready to go to work and reproduce themselves in Stellite.**



# HOW TO SUBSTITUTE

**Single out the property to be replaced: tensile strength, electric conductivity, etc., and consider other materials besides metals**

IF, FOR ANY reason at all, your metal supply is cut off, you have but one of two choices to make. They are:

(1) Use a substitute material, or

(2) Start producing something which does not use that metal.

No need to become upset about that situation, though, even though shortages of materials are coming. There is no doubt about the shortages. But if you begin to look around now, for serviceable substitutes, there is good possibility that you may be successful.

### Properties, Not Materials

And yet the problem is not one of finding substitutes for scarce materials as much as it is a problem of locating materials with "specific properties" to replace those found in the materials formerly used. So indicates Dr. Edwin Gustus, director of research for the U. S. Army Quartermaster Corps during the last war, and vice president of the Bjorksten Research Laboratories, Inc., Chicago.

Dr. Gustus sounded the warning that something should be done about that situation before it is upon you. If you wait too long, it may be too late to do anything about it.

"The engineer who has a problem of metal substitutes would do well to single out the property which he must substitute. If it is a surface property which he needs, he need not worry too much about what lies beneath the surface," Dr. Gustus remarked.

"If it is electric conductivity, he should not worry too much about the name of the metal which does the conducting. If it is tensile strength, he should take a hint from the glass and plastics combinations being used as bullet-proof covering in combat planes and in helmet linings of soldiers in the field."

Dr. Gustus pointed out the shortsightedness of confining your quest of substitutes to the field of metals alone. Laminated textiles, that have been treated with plastics, may offer a good alternate.

"Such objects," he offered, "are capable of being plated with metals. They could be coated with graphite, given a plating bath or they may be sprayed directly with the metals themselves in a high vacuum. In this way they obtain the surface properties of metals while they have an interior of very much more available substitute materials."

### Call on Laboratories

He emphasized that the average problem of metals substitution might be attacked through laboratory research, but that all problems were not average. A few metals, as for example stainless steel alloys, beryllium-copper alloys, and magnetic alloys containing cobalt, nickel and aluminum, are "so far superior to substitute materials at this time that they present true problems of scarcity."

# NEW ALLOY STEELS ANNOUNCED

**AISI develops two series, leaner in alloy content than the NE wartime steels, and treated with boron to save nickel and moly**

NEW ALLOY STEELS, leaner in alloy content than the National Emergency steels of World War II, and designed to replace the more heavily alloyed standard steels, have been developed by members of American Iron & Steel Institute's technical committee on alloy steel through cooperative research in steel company laboratories.

Work on these steels was started several months ago when it became apparent that the standard alloying elements would become critically short in the face of an expanded defense program.

The new steels employ very small quantities of the critical alloying elements, nickel, chromium and molybdenum and are treated with a non-critical alloy containing the element boron. The use of critical elements is presently restricted by government orders. There are unlimited supplies of boron in the United States.

Boron acts to increase the hardenability of the steel, that is, its ability to harden deeply when heat treated by quenching and tempering. That action increases the strength of the steel without reducing its toughness.

Two series of steels have been developed for practically all the engineering and constructional purposes for which standard alloy steels are used. The new steels, which are balanced multiple alloy steels are designed to make maximum use of the alloys contained in scrap.

Both series contain an average of 0.30 per cent nickel and 0.12 per cent molybdenum. One series contains an average of 0.25 per cent chromium, the other 0.43 per cent.

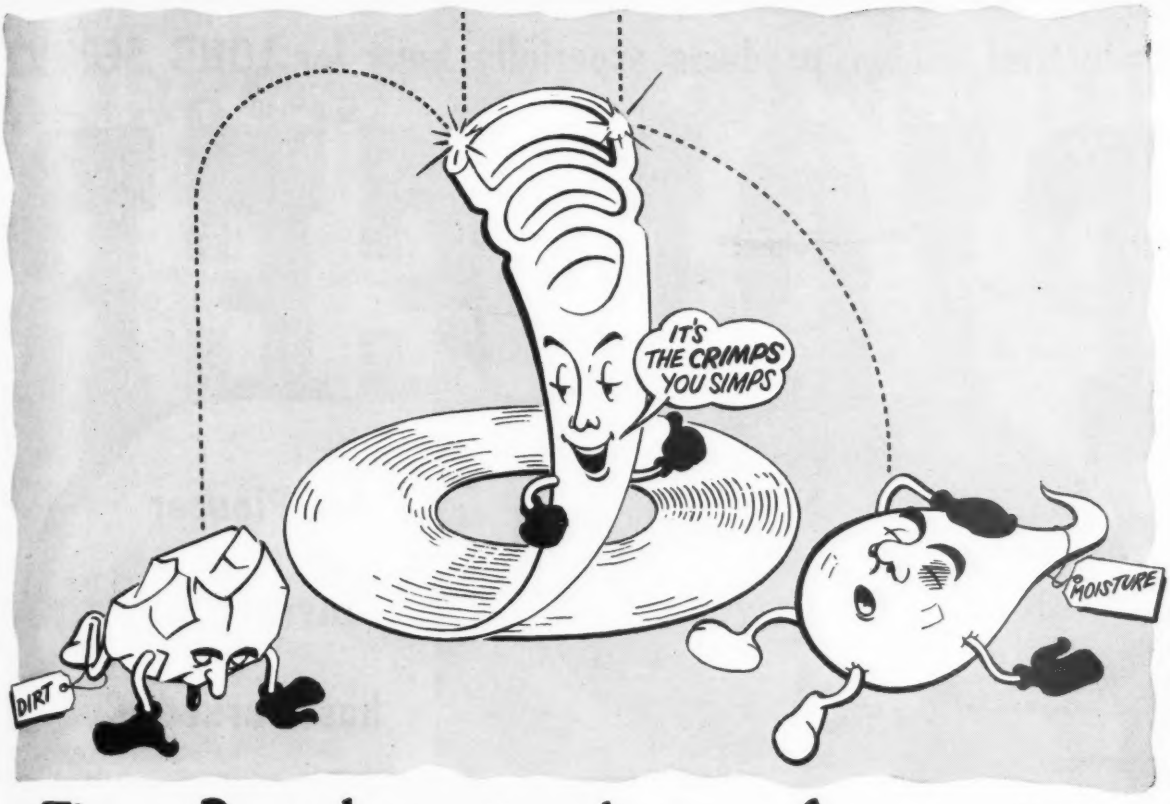
National Emergency steels of World War II contained nearly twice that quantity of critical elements. Such savings will not only assist in building the defense stockpile, but will make more alloys available for military uses.

**THE NEW METALS—Molybdenum, Titanium and Zirconium**

| COMPARED METALS | Approx. melting pt. °F. | Weight in pounds per cu. in. | Weight in pounds per cu. ft. | Weight ratio† | Expansion ratio† | Thermal conductivity ratio† | Specific heat ratio† | Tension Modulus in Millions |
|---|---|---|---|---|---|---|---|---|
| Magnesium* | 1204 | .063 | 109 | 1.00 | 1.00 | 1.00 | 1.00 | 6.3 |
| Beryllium* | 2345 | .066 | 114 | 1.05 | 0.46 | 1.00 | 2.10 | 37 |
| Aluminum* | 1215 | .098 | 170 | 1.56 | 0.92 | 1.40 | 0.86 | 10 |
| TITANIUM* | 3300 | .164 | 284 | 2.60 | 0.33 | 0.19 | 0.50 | 17 |
| ZIRCONIUM* | 3200 | .23 | 398 | 3.65 | 0.19 | 0.05 | 0.26 | 11 |
| Plain high chrom. stainless steels | 2750 | .28 | 485 | 4.45 | 0.42 | 0.26 | 0.43 | 29 |
| Plain carbon and low alloy steels | 2700 | .286 | 490 | 4.50 | 0.46 | 0.51 | 0.43 | 29 |
| Austenitic stainless steels | 2600 | .29 | 500 | 4.58 | 0.67 | 0.17 | 0.47 | 28 |
| Nickel* | 2650 | .32 | 560 | 5.13 | 0.50 | 0.58 | 0.42 | 30 |
| Copper* | 1980 | .32 | 560 | 5.14 | 0.63 | 2.50 | 0.37 | 16 |
| MOLYBDENUM* | 4760 | .37 | 650 | 6.00 | 0.19 | 0.92 | 0.24 | 50 |
| Tantalum* | 5400 | .60 | 1050 | 9.70 | 0.25 | 0.34 | 0.14 | 27 |

*Commercially pure metals. †Approximate ratio (near 70° F.) Magnesium = 1.

*(Courtesy Tempil Corporation)*

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And, for your greater convenience we have just recently brought out Dryseal in a nifty-50 one-coil carton. This carton, which has been attractively designed for easy identification in stock, contains one 50-foot coil of Dryseal . . . is easier to handle, light weight, economical.

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# CORROSION! CORNER IT!

**Electrolytic variety is the low-down rat that plays hob with your specifications, so don't let him play his tantalizing tricks on you**

By

J. R. RANTZ

Process Engineer
Boeing Airplane
Company
Seattle, Wash.

THERE ARE TWO basic types of corrosion and each of them can be checked.

Simple chemical corrosion is the type we observe if we leave an iron nail on the ground overnight exposed to dew. The resultant rust occurs simply because the iron has been exposed to a corrosive medium—the dew. Cover the vulnerable iron with an anticorrosive, and this metal, as an airplane part, adequately stands the length of service life normally expected of the airplane itself.

### Beware the Electrolytic!

But it is the second type of corrosion, the electrolytic type, which pits dissimilar metals against each other, that shivers the fillings in the teeth of aircraft project engineers.

All that is necessary for this type of corrosion to occur is for a conductive medium to bridge two dissimilar metals grounded to a common base. These metals which are common to aircraft manufacture are shown in the accompanying chart and are listed in sequence of voltage relationship. Metals furthest apart on the chart have the greatest corrosive potential between each other, *and the most ignoble metal of a pair is the one destroyed.*

A good example of such a corrosive-producing battery is the airplane's equipment. Airplane radio noise requirements are such that all equipment and individual materials must be grounded to the basic structure of the ship or static will result. Somewhere in the airplane's equipment are magnesium, aluminum, zinc, and all of the other metals listed in the chart with the probable exception of gold and platinum.

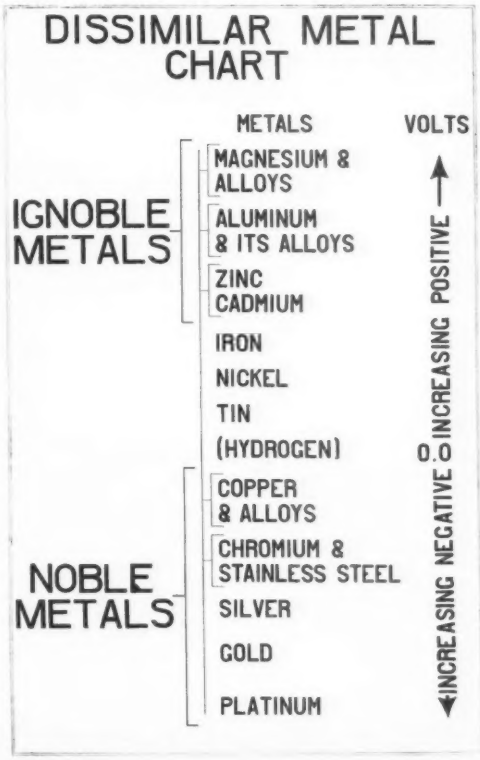
Given then, the common ground and the dissimilar metals, all that is required to generate the electrolytic corrosion is a conductive medium to complete the circuit. This medium is moisture, and in airplanes it is ever-present.

An airplane stands on a field awaiting take-off. It has been there for three or four hours and air in all of its interior closed compartments has reached an equilibrium with the air outside. This means that spaces such as the housing of a motor, the empty portions of gas tanks or the volumetric spaces in wing compartments will carry air of this condition as the airplane takes off and flies through increasing elevations.

With an increase of elevation comes decreasing temperatures; and, at today's normal cruising altitudes, these temperatures are often below the dew point of the moisture-laden air which has been carried from the ground. The result is rain within enclosed areas such as wings and tanks, and condensation against the cold metal bodies in surrounding areas.

Such water differs greatly from distilled water, a notoriously poor liquid conductive medium. This condensed water is, in fact, a conductive medium because it probably was condensed in the presence of carbon dioxide, oxygen, sulphur dioxide, hydrogen sulfide and in many cases contaminated to some extent with exhaust fumes and lead bromide. Acting, then, as a conductive medium between commonly grounded dissimilar metal parts, it can put the system out of commission just as fast as Junior can with his toy hammer.

There is no element of chance about the destructive ability of such a corrosive circuit. If inadequate protection exists, corroded parts result. The situation is just as fixed as the multiplication table. The conductive medium will take material from that




**This dissimilar metal chart indicates relationship between materials from a standpoint of voltage with a closed external circuit and immersed in a suitably conductive solution. Hydrogen is the standard from which voltages are measured. Highest material (in chart) will be corroded or dissolved or destroyed if a conductive fluid bridges it to any other material in the chart, so long as the circuit between the materials is closed. Rate of destruction is proportional to spacing in chart, or to the voltage that exists between the two. Voltage figures not absolute, and will vary slightly with other solutions, concentrations or temperatures. A few unusual circumstances can reverse the metals position (in chart) such as the tin-nickel series, by special oxidizing solutions. Do not combine an ignoble metal with a noble metal unless protection is provided, or corrosion will destroy the ignoble metal.**

metal forming a part of the corrosive battery which is the most positive on the list and either retain it in solution or deposit it on the battery's other less positive metal. All manner of electrical equipment is made up of dissimilar metals—a single electrical housing on at least one occasion has held copper, brass, aluminum, chromium, iron and silver parts all bolted, soldered, screwed, or fastened together. It corroded.

Similarly, parts of the hydraulic systems, mechanical systems, and the body structure system itself possess all of the qualifications for corrosion if they are not properly armored against it.

### An Example of Trouble

One example of corrosion encountered was in a device for changing air pressure variations to electric current impulses which had red copper, brass and aluminum parts, a chromium-plated plunger inside a bare iron housing and silver-plated contact tips. The manufacturer closed one end off as a plug-in electrical connection, lock-wired shut. He put an "O" ring on the other end, set it against a shoulder, held the end in assembly by screws and thus assumed the unit was isolated from moisture.

The only thing wrong was that one of the openings through the "O" ring end was a static opening—a hole drilled directly through to the inside anyway! Red rust ran around the base of the part on both sides, the spring in the center rusted and the chrome-plated plunger didn't plunge any more because of the rust on the core.

Another example was of several circuit breakers. One had a bare iron plunger and the rust accumulated to the point where the space between it and the brass lining inside did not allow motion of the part. It stopped as a circuit breaker and also stopped whatever action was intended to be secondary with it on the plane. The bare iron plunger, in conjunction with the copper alloys, rusted from chemical corrosion. This rust was accelerated by the fact that copper, another dissimilar metal, also was in intimate contact. A water film could easily bridge across them and rapidly corrode the iron in an attempt to protect the copper.

A second circuit-breaker had a nickel-plated plunger, designed in conjunction with a copper alloy housing, and it corroded the same as the iron. It also stopped operating as the corrosion product accumulated. The manufacturer of a third breaker perhaps thought that if iron rusted and nickel corroded, he would chrome plate it. But when you put chrome plate directly on iron, as you have witnessed on your own automobile bumper, you have a problem of the iron being exposed through cracks or pores in the chromium and rusting. This circuit breaker failed because the rust accumulated through such cracks to the place where it was inoperative.

The answer to these conditions is not a big problem. The chrome plate cost the manufacturer ten times as much as cadmium plate, and if he had cadmium-plated both the plunger and the housing, no corrosion would have taken place. He could have nickel-plated or tin-plated both of them. Anything to produce similar mating surfaces would have answered the problem very nicely.

An electric utility had trouble with two deep well pumps at one of its generating stations. When one of them was pulled out of the ground, the shaft was found to be eaten a third of the way toward the center. The construction was of a series of bronze impellers shrunk on a steel shaft supported on bronze bearings, and the electrolytic action had eaten away the steel where it was exposed. It had a bare iron shaft in conjunction with copper alloy impellers on the shaft, and the combination continued to corrode in whatever conductive media existed in contact with it, destroying the iron in an attempt to protect the copper parts. The result was exactly what you would expect.

We experimented with a water system with aluminum parts, where we found that a check valve had failed because the flapper had been attached by means of a Monel rivet through a stainless steel hinge with a bare iron coil spring to close the flapper. The bare iron in the system in immediate contact with stainless steel was destroyed completely.

### Concentrate the Responsibility

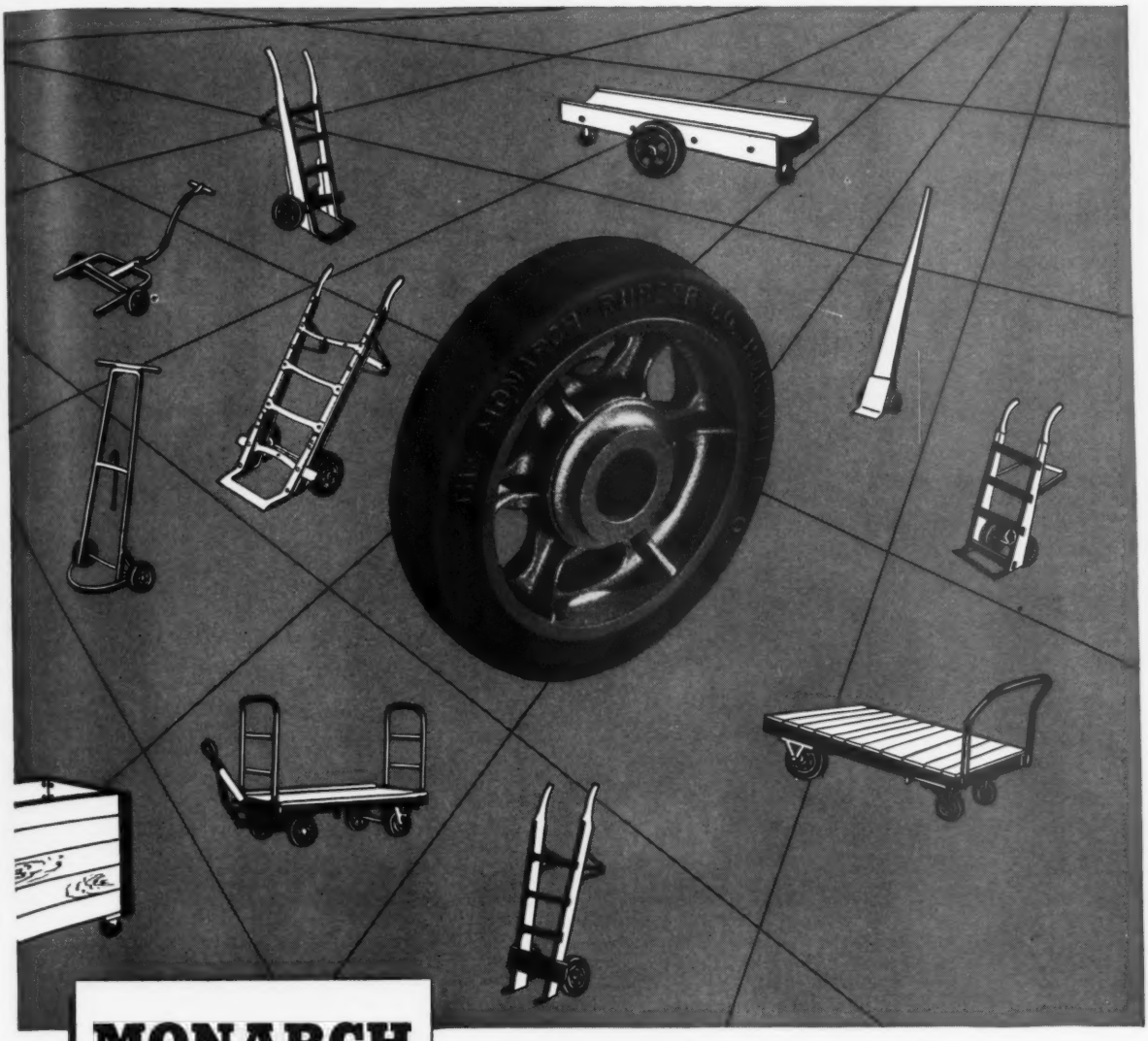
Boeing Airplane Company has done two basic things to insure that no such corrosive battery can exist on any of its airplanes.

It has given the responsibility of selecting the finish to the engineer who designs the part itself and who is thoroughly acquainted with the nature of surrounding metal parts. His

*Concluded on page 92*

**LEFT—Drain valve with aluminum packing nut, aluminum casting for the base. Stainless steel ball in aluminum socket corroded beyond use by difference in potential between metals.**

**RIGHT—This aluminum pump sounded highly non-corrosive. So did stainless steel tank holding alcohol-water solution. But when pump was bolted into the tank, the steel corroded badly.**



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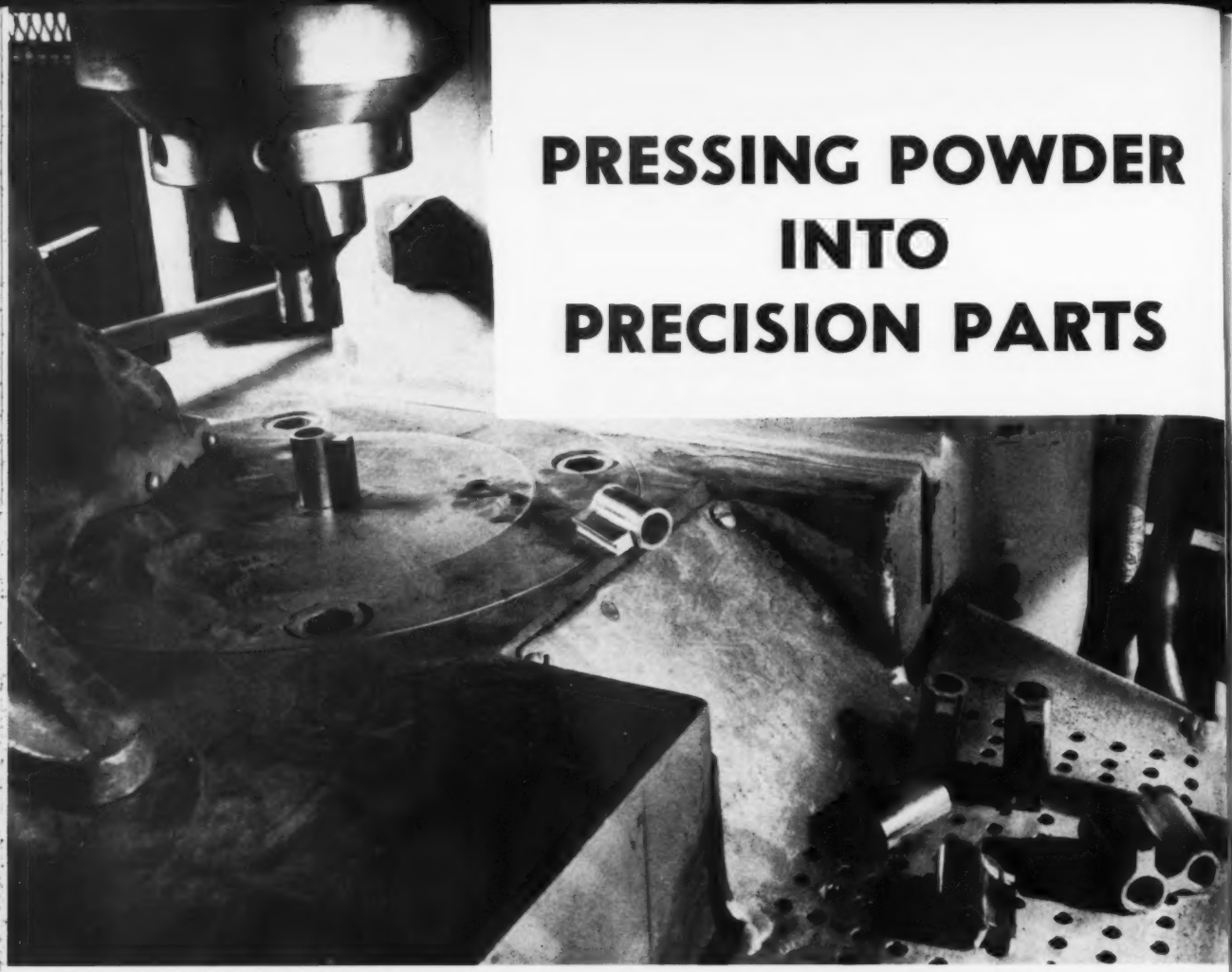
# PRESSING POWDER INTO PRECISION PARTS



**Close-up of press forming lockset cylinders. Top punch has risen to clearance height and bottom punch has ejected cylinder, about to be swept off the table by the sweep (left)**

ONE of the ingenious achievements of modern industry is the use of fine particles of metal to produce precision parts. For such parts not only duplicate most of the characteristics of metal parts made by other means, but they are actually superior in certain respects—and all at a fraction of the cost.

Chief exponent of the technique on the West Coast is Kwikset Locks, Inc., which operates its own Powder Metallurgy Division in Anaheim, California, The installation, now available to other Western manufacturers, promises to effect great economies in the defense production that lies ahead.

Unique properties made possible by the powder-metal technique stimulate the solution of both new and existing problems in manufacturing. To work on its own and its clients' particular problems, this manufacturer of builders' hardware has set up complete laboratories for tests, analyses and research.

Although it calls for a wealth of engineering skill and experience, the powder metallurgy technique is simply a matter of pressing the powder into a compact or "briquette" and then baking or "sintering" it in a furnace.

### Pressing Method

If the powder contains two or more elements, they are thoroughly blended before pressing. A mechanical press is commonly used, with a precise die and punches having the configuration of the desired part. When the die has been set in the table and the top and bottom punches set in place, here is what happens:

1. With the press in "fill" position, an exact quantity of powder is automatically measured into the die.
2. Top punch moves into the die to a predetermined depth, sealing the die.
3. Bottom punch moves up a predetermined distance, both punches

**Here is the powder mixer in which the elements are blended before pressing. What kind of powder to use, and the compressibility and apparent density, are only two of the various questions involved with a direct bearing on design.**

compressing the powder to its required size and density; ratio of compression ranges from 1½-to-1 up to as much as 3-to-1.

4. Top punch moves up and out of the die to a clearance height, while the bottom punch remains stationary.
5. Bottom punch then moves up to the top of the die, ejecting the briquette to the table, where it is removed from the die cavity by a sweep.
6. Bottom punch returns to its original position and the sweep serves a double function by refilling the die, preparatory to another cycle.

### Sintering Operation

Briquettes, which are called "green" at this stage, are next placed in an atmosphere-controlled furnace for a predetermined length of time. The atmosphere within the furnace is a safeguard against oxidation. Sintering temperatures are of the order of 2000° F.

As parts emerge from the furnace, they pass through a water-cooled chamber where their heat is removed to a point well below the oxidizing temperature.

Secret of the powder-metal process lies in the inter-particle surface bonding created by sintering. Before its trip through the furnace, each briquette has a very low tensile strength; it can actually be crumbled between the thump and forefinger. In the course of sintering, tensile strength increases many fold, to values comparable with those of other metals.

Powder metallurgy frequently provides a cost-reducing alternate to familiar casting, forging, stamping and machining methods. Simultaneous advantages often result in product function and product quality.

### Startling Combinations

Perhaps the most startling aspect of the powder-metallurgy technique is the way in which it permits the combination of metals and other substances that normally defy mechanical joining or alloying. This gives the designer complete freedom in making combinations to produce the sought characteristics of each element. Moreover, the resulting products will be more pure in their chemical composition than parts made with regular alloys.

Copper and carbon, ordinarily non-alloying, are combined to give commutator brushes their conductive and anti-friction properties. To make contact points both heat-resisting and wear-resisting, silver can be combined with tungsten; the latter has a melting point so high that it can be combined with other metals only through powder metallurgy.

Copper, on the other hand, has a relatively low melting point, which makes it especially useful in raising the tensile strength of powder-metal parts. In this application, copper is liquefied during sintering. Thus it flows around the particles, further increasing the bonding action.

### Heat Treating and Coining

Additional strength can also be obtained by heat-treating the briquette after sintering, in the same way that other metal parts are strengthened. When heat treatment is not possible or not desirable, powder-metal parts can be strengthened by coining.

Powder-metal parts always have a certain porosity, and for this reason they can never reach the upper values of tensile strength attainable by solid metal parts. This is seldom a disadvantage, however, since solid metal parts are usually considerably stronger than their function requires (sometimes as much as 25 times stronger than necessary).

### Advantages of Porosity

It is often desirable to lower the tensile strength of powder-metal parts by increasing their porosity, thereby arriving at a less exaggerated factor of safety with attendant economy.

Porosity also leads to some unique advantages in powder metallurgy. One of the best-known of these is the self-lubricating bearing. Impregnated with oil from 10% to 25% by volume, the bearing is particularly useful in home appliances, in machines which must not contaminate the product (such as laundry and paper machinery) and when the bearing itself will not be readily accessible for lubrication. The suspended lubricant expands and flows out as its temperature rises, and is reabsorbed as it contracts while cooling.

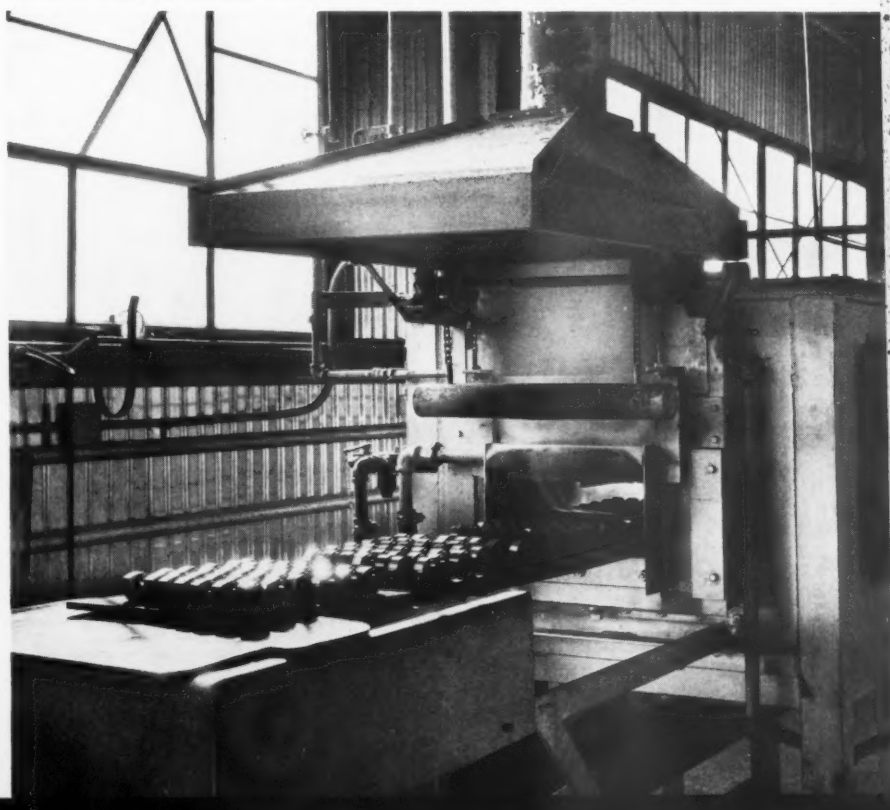
Parts made from iron and steel powder are sometimes impregnated with oil to deter corrosion, something which is naturally impossible for parts made of non-porous metal. In addition, powder-metal parts can be stained, lacquered, enameled or electro-plated in exactly the same way as other metal parts.

### Questions to Be Decided

Can the part be pressed with equal density throughout its different sections? What kind of powders will be used to produce the product? What are the compressibility and apparent density of the powder? Will the part shrink or expand after sintering? What will be the pressing density of the part which may control the shrinkage or expansion of the finished part?

These are just a few of the questions which have a direct bearing on design, for the tools and accompanying specifications for their use actually prede-

**Green parts on conveyor belt entering sintering furnace, which is atmosphere controlled as safeguard against oxidation. This is only one of several types of furnaces.**



termine every property of the finished product.

### Tolerances Satisfactory

When modern equipment is used, dimensions decided upon by the designer can usually be obtained within acceptable limits of tolerance. In rare cases demanding greater precision, a sizing operation can be added. The finished part can also be given straight, smooth sides, without the undesirable taper found in die-cast parts, and without the need for burring.

It is the powder-metal designer who helps the client's engineer to determine the part's porosity and its tensile strength, its impact resistance, ductility, conductivity, magnetic properties and other desired characteristics.

### Ingenuity Required

Variables which govern these properties, in addition to the design of the die and punches, include: powder mixture, quantity of the fill, pressing density, speed and temperature of sintering, and any final processing operations.

There are no manuals that accurately guide a designer regarding these factors. The job calls for a lot of experience and a lot of teamwork. Before designing tools to press parts from powdered metal, the designer must first get all available information from the quality-control engineer, the laboratory, the pressing foreman and the toolroom foreman.

The designer's problem is not just to devise methods of duplicating a part previously manufactured another way. Instead, he attempts to improve on the original part by taking advantage of the special applications of powder metallurgy. Sometimes he can make a single powder-metal part that will replace a whole assembly of machined parts.

In other cases, it may be that the ultimate configuration is too complicated even for powder-metal production, but the latter may so reduce subsequent operations that its use will be more than justified.

### Savings Effected

Savings effected in the design stage are but a few of many economies offered by powder metallurgy. Cost of setting up the tooling is low, and original cost of the tooling is quickly amortized. Moreover, the technique involves little or no scrap waste.

Design and engineering are both integral parts of the service offered by Kwikset's Powder Metallurgy Division, which also includes a growing array of up-to-date equipment, housed in its own building.

A furnace, a powder-mixer and a complete range of presses, up to and including one of 300 tons capacity are installed. A high-speed rotary model is capable of producing small parts at a rate of 15,000 per hour. Other presses on the line form larger parts at a lesser rate.

Although speed naturally depends upon the size and complexity of the part, powder-metal production is relatively fast.

### Interest Increasing

To make best use of these varied facilities, the design department standardizes pressing tools as much as possible, making them interchangeable from one press to another.

Although the proven advantages of powder metallurgy have been widely enjoyed in the Eastern United States for many years, full usage of the technique will receive appreciable expansion in Western industry. Increasingly, manufacturers' product engineers are giving consideration to the method at the part's design phase.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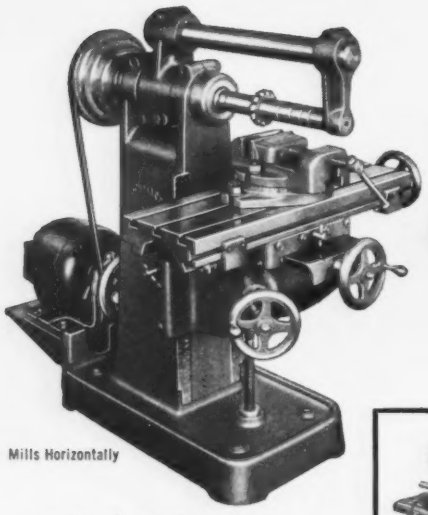

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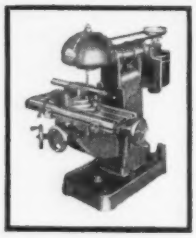

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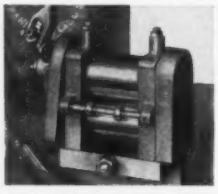

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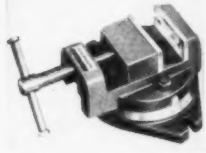

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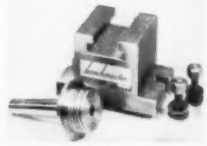

**BENCHMASTER CHUCK ADAPTER AND TOOL BLOCK**—converts Benchmaster Mill to turning operations—Arbor equipped with No. 2 Morse taper, 8 pitch 1½" thread for faceplate or chuck. Block accommodates regular lathe tool post and tools.

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# SELECT THE RIGHT CUTTING FLUIDS

**Tough material requires heavily sulfurized or equivalent type of oil, but avoid sulfur (unless non-corrosive type) for copper and its alloys; use soluble for friable material**

CUTTING FLUIDS are as necessary to the production phase of our defense effort as machine tools themselves. Fluids used in metal machining are generally present to serve one or more of four basic purposes:

1. Providing lubrication between the tool and the work.
2. Cooling the tool and the work.
3. Protecting the work against corrosion.
4. Flushing away the chips.

How much lubricating or how much cooling is effected depends upon (1) the metal being machined, and (2) the machining operation in process.

In addition to performing these basic functions listed above, cutting fluids perform the following secondary functions:

1. Minimizing power used in cutting.
2. Prolonging tool life.
3. Providing a good finish.
4. Assuring accurate dimensions.

Types of cutting fluids in common use today are:

1. Alkaline solutions.
2. Soluble, or water-miscible oils.
3. Heavy duty soluble oils.
4. Straight mineral oils.
5. Fatty oils.
6. Blends of fatty and mineral oils.
7. Sulfurized mineral oils or blends containing chlorine compounds (usually in combination with sulfur).
8. Mineral oils fortified by various synthetic materials of which certain phosphorus and nitrogen compounds are examples.

Performance of a cutting fluid for any specific operation is influenced by many factors, including:

1. Type of machining operation.
2. Machinability of the metal being worked.
3. Susceptibility of the metal (being worked) to corrosion or tarnishing by the cutting fluid.
4. Cutting speeds and feeds.
5. Type of finish desired.

Any sulfurized oil containing even minute traces of free sulfur will tarnish alloys of copper. When tarnishing of the work or machine parts is objectionable, such oils should not be used with copper and its alloys. Sulfurized oils of the non-corrosive type, however, may be used with any type of metal.

By
E. C. HEINZ
Manager,
Wholesale Sales
Tidewater Associated
Oil Co.
San Francisco
Calif.

The kind of metal and the machining operation are the principal factors influencing selection of a cutting fluid. As a general rule, soluble oil emulsions are applicable where cooling requirements predominate, and compounded or sulfurized oils where lubrication between the tool and chip is of maximum importance.

### Shape of Chip a Good Guide

One of the most useful practical guides is the shape of the chip. A long curling chip which bears heavily on the tool indicates tough material which requires a heavily sulfurized or equivalent type of oil. If the chip bears hard but breaks off just above the tool, a lightly sulfurized or equivalent type of oil is satisfactory.

Friable materials, such as cast irons, which do not produce chips which bear on the tool with any great force, may be machined with a soluble oil, or even dry in many instances.

As the percentage of carbon in carbon steels increases, the machinability properties become poorer. Low carbon steels are readily machined in most operations with a lightly sulfurized oil. Increased percentages of carbon require corresponding increases in the amount of surface active ingredient in the cutting fluid.

Alloy and corrosion resisting steels and the Monel metal usually produce long curling chips which bear heavily on the tool thereby requiring relatively heavily sulfurized or equivalent type oils.

### What's Best for Machining

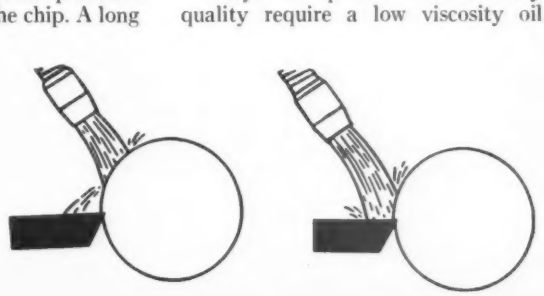
Free cutting alloys of copper, such as leaded copper, leaded brass and free cutting yellow-brass, may be machined with a low viscosity mineral oil or with a soluble oil emulsion.

Readily machinable alloys of copper, such as red and yellow brass, manganese bronze, Muntz metal, Tobin bronze and leaded nickel silver, may be machined with a non-corrosive sulfurized oil with about 0.5% added sulfur or with compounded mineral oils containing from 5% to 15% fatty oil.

Copper itself and its tough alloys, such as commercial bronze, phosphor bronze, nickel silver and copper-aluminum alloys, may be machined with non-corrosive sulfurized oil containing from 1.0% to 3.0% of added sulfur or compounded oils with from 10% to 20% fatty oil.

Aluminum and its alloys, except those high in silicon content, are readily machined. The free-machining alloys may be machined with a light mineral oil or soluble oil emulsion. Highly alkaline soluble oils are to be avoided.

Alloys of poorer machinability quality require a low viscosity oil



**Incorrect method of applying cutting oil is shown in the picture at the left. The proper way to do the job appears at right.**

## Avoiding Skin Infections from Use of Cutting Oils

SKIN INFECTION, or dermatitis, sometimes occurs among users of cutting fluids.

Although the cutting fluid itself is seldom responsible, except as a carrier and culture for germs or bacteria introduced from an outside source, nevertheless, the prejudice which can be created against the oil in use at the time makes it imperative that prompt action be taken to trace the trouble to its source.

Simple, but effective, preventive measures will usually eliminate the possibility of skin troubles.

Most cutting oils are sterile when received by the customer and do not contain any ingredients harmful to normal human skins. It should be remembered, however, that dermatitis may be excited in predisposed persons from continued exposure to any material to which they may be allergic.

When it is found that a person is predisposed to skin troubles, he should be transferred to another department or to work which does not require handling cutting fluids.

Cleanliness of hands, arms and working clothing is the most important single factor in preventing skin troubles. The liberal use of a neutral soap before quitting work for meals or for the day will usually prevent, or clean up, an epidemic of dermatitis.

Care should also be taken that work clothing is changed and cleaned at least once a week. The latter is important as any oil that remains on clothing for an appreciable period of time picks up dirt and dust and tends to harden.

Continued rubbing of the skin by oil or dirt hardened clothing may cause skin eruptions purely as a result of irritation, regardless of how neutral the oil may be.

Several hand creams are on the market which are very effective in preventing industrial dermatitis when supplemented by personal cleanliness.

The first, and most important, thing to do when investigating skin infections is to recommend that all affected personnel be relieved from work or transferred to another job until cured; otherwise control and elimination of the trouble is difficult.

The next step is to drain and replace, or sterilize, the cutting fluid so as to eliminate all living germs or bacteria.

The final step is to institute cleanliness habits which will clean up the epidemic and prevent its recurrence.

Cutting fluids may be disinfected by heat or by the use of germicides. Heating to the pasteurization temperature of 140° to 180° F. (60° to 82° C.) for a period of from 30 minutes to one hour usually will disinfect the oil.

A temperature above 180° F. (82° C.) is required for true sterilization and this is preferable with all except water miscible oils. An emulsion will usually be unstable if heated to the sterilization temperature. It is better to discard it rather than try to sterilize by heating.

fortified by an oiliness or wetting agent. The latter type of oil is suitable for practically all aluminum alloys as well as for white metals (zinc and its alloys), and will generally be found superior to a soluble oil.

Aluminum is machined at much higher speeds than steel. Tools should be ground so that a slicing action is obtained, with considerably more side and top rake being necessary for aluminum than for steel. Clearance should be large enough to prevent rubbing, but too large a clearance may cause chattering.

Magnesium and alloys high in magnesium should be machined with a very low viscosity oil. Soluble oils should not be used because of the fire hazard created as a result of the affinity of magnesium for water.

### For Grinding and Honing

In grinding, considerable heat is generated. Dilute emulsions containing from 50 to over 100 parts of water to one part of soluble oil are generally employed for surface and cylindrical grinding and less dilute emulsions for centerless grinding. For thread and form grinding, sulfurized oils of the non-soluble type are more satisfactory than emulsions.

Honing is a special surface finishing operation which requires a low viscosity cutting fluid, preferably one fortified by a sulfurized base or other suitable additives.

A cutting oil of the type commonly used for machining aluminum will generally be satisfactory for honing ferrous metals. Also, a non-corrosive, sulfurized base type of cutting oil containing from 4 to 5 per cent of added sulfur may be cut back with from one-half to an equal part of kerosene to make a satisfactory honing oil for ferrous metals.

In emulsifying soluble oils for metal cutting and grinding, the oil should always be added to the water in order to obtain the desired oil-in-water type of emulsion. If water is added to the oil, an unstable water-in-oil emulsion may be obtained.

Hard waters, or those having an acid reaction, tend to cause unstable emulsions and rusting of steel. If rusting of the work or machine occurs, or if the emulsion is unstable, the use of about 0.5 ounce of soda ash or trisodium phosphate per gallon of emulsion will usually soften the water sufficiently to overcome any difficulty caused by hard water.

If the water hardness is known in terms of grains per gallon, a general rule is to add about 1.5 ounces of water softening agent per 100 gallons of emulsion per grain of hardness.

### Testing Emulsion Strength

Most soluble oil emulsions are broken by admixture with strong acids or other materials, such as a concentrated sal ammoniac (ammonium chloride) solution. This offers a convenient means for testing the strength of emulsions in service.

If a measured sample of emulsion is placed in a graduated glass container and the emulsion broken by acid or a sal ammoniac solution, the amount of separated oil may be readily determined and the proportions of oil to water computed on the basis of the quantity of emulsion initially present. A period of several hours may be required to secure complete separation.

A "heavy duty" soluble oil is one containing an extreme pressure additive which permits the use of an emulsion for machining and grinding operations that would otherwise require a non-soluble type. Emulsions made with this type oil have excellent load carrying characteristics in addition to good cooling properties.

A heavy duty soluble oil will not replace conventional sulfurized or equivalent type oils for severe operations. For many operations, however, on free cutting steels, including hobbing, milling, turning, drilling, boring and sawing, tool life at least equal to that obtained with a non-soluble oil is possible with a suitable heavy duty soluble oil.

An oil-water ratio of one part of heavy duty soluble oil to 15 parts of water will take care of most requirements. For the less severe jobs of milling, drilling, turning and boring, 30 parts of water generally will be satisfactory.

### Automatic Screw Machine Use

Cutting oils which are non-corrosive to copper and its alloys and which have good stability properties and suitable viscosity characteristics may also be used as machine tool lubricants.

In automatic screw machines, it is particularly desirable to use one oil for both cutting and lubrication because of the ever present possibility of leakage of the lubricating oil into the cutting oil system, thereby decreasing the effectiveness of the latter.

A "heavy duty" soluble oil, when not diluted with more than 20 parts of water, is also suitable for dual purposes, but care should be taken that an emulsion is not recommended for lubrication of machines equipped with clutch discs and other parts made of fiber, or any material which is not completely water resistant.

# Clean Engines Last Longer
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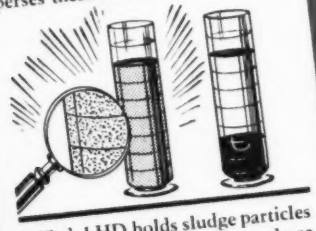
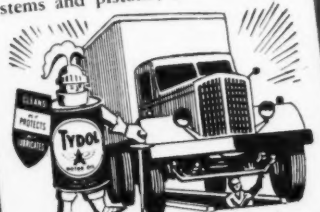
# KEEPS ENGINES CLEANER!

## Why TYDOL HD Keeps Engines Cleaner

**1.** Rich in potent detergent additives, Tydol HD quickly loosens sludge (gum, varnish, carbon) from vital parts . . . actively disperses these foreign deposits.



**2.** Tydol HD holds sludge particles harmlessly in suspension where they cannot cause wear. With ordinary oils, sludge settles onto valve stems and pistons; soon hardens.




**3.** When Tydol HD is drained, out goes sludge, too . . . because it's suspended in the oil. Valve stems, pistons and rings stay free and clean because Tydol HD gets rid of sludge that other oils can't budge.

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No doubt about it. An engine that's kept clean . . . free of power-robbing sludge, carbon and varnish . . . gives you more trouble-free miles of top performance. And Heavy Duty Tydols are winning wide acclaim as the oils that drive out sludge and carbon. In fact, they *keep engines cleaner* than any other oil . . . protect far better against wear. Try them! See what you save when you switch to the heavy duty oils that *clean* as they *protect* as they *lubricate*. Get *three* jobs done; *not* just one!

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**TYDOL HD S-1**—Higher detergency level than Tydol HD. For every type of engine subjected to frequent and continued over-loading. For engines in delivery service making many stops and starts. SAE grades 10, 20, 30, 40 and 50. In drums.

**TYDOL HD S-2**—Highest detergency level of the HD series. For high performance super-charged engines using all types of diesel fuels, under the most extreme operating conditions. SAE grade 30. Sold in drums.

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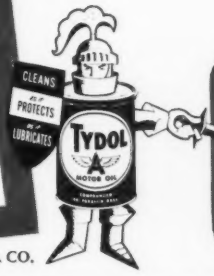


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# ROLL FORGE THEM TO YOUR SPECS

**New application of an old process provides weldless steel rings of high quality made to specifications. Uniform granular structure of the ring, induced by rolling under high pressure, affords a superior product**

**These steel rings were made by the new roll-forging technique described in this article. They are all one-piece, with no welded joint. Uniform granular structure of the metal makes machining easy.**

ANOTHER engineering theory has become a practical reality: development of a new roll-forging technique. With this process, weldless steel rings of unprecedented quality can be fabricated with an impressive variety of dimensions at a production cost that is generally lower than that of the currently conventional forgings.

This new roll-forging process consists briefly of using steel rolls and hydraulic pressure to convert prefabricated steel "doughnuts" into rings with eight inch to 76 inch O.D., weights of 50 to 2,500 pounds, and lengths up to 20 inches.

### Advantages of Rolling

Comparable rings heretofore manufactured without welding in Western factories were either cast, hammer-forged, or machined from solid materials.

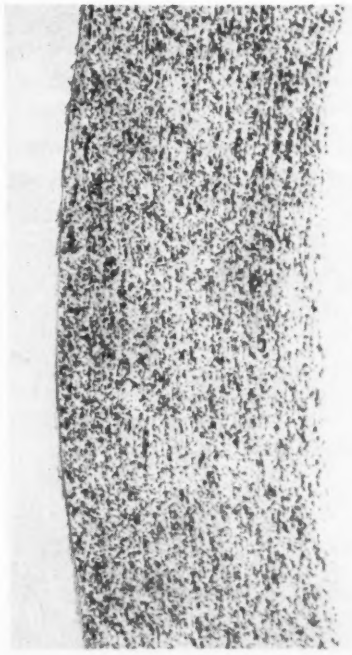
Castings were fairly inexpensive, but lacked the fine grain and machine-finishing properties that were required for first-quality products.

Hammer forgings had better grain qualifications, but lacked the most desirable degree of granular (or molecular) orientation, necessitated the use of comparatively-expensive production methods, and were dimensionally non-uniform to such an extent that they often required considerable machine finishing.

Rings machined from solid steel materials had the best physical qualifications, but were inordinately expensive due to the need for costly tooling and the tedious nature of requisite machine-fabrication methods.

New roll-forged rings cost little more than castings because (1) they require relatively few machine finishing operations, (2) they have the uniform grain structure that could not be attained in steam-forged rings, and (3) they are produced with a fractional quota of the time and tooling required to make rings with machine-cutting equipment.

**Photomicrograph of a cross-section of a roll-forged ring. Uniform granular structure shows up plainly, quite unlike usual "Xmas tree" structure of drop forging.**



Accordingly, the new rings are currently being used as basic structural components in a variety of important products—such as industrial heat exchangers manufactured by Southwest Welding and Manufacturing Company at Alhambra, Calif.; gear assemblies made by Johnson Gear & Manufacturing Company of San Francisco; and jet-propelled aircraft assemblies now being produced by Ryan Aeronautical Company.

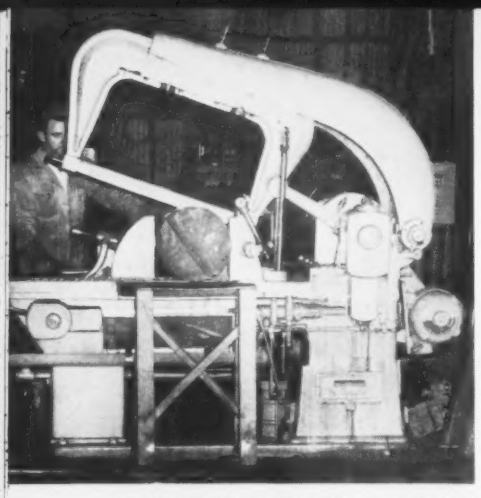
Materials used in forging these rings include 347 and 310 stainless steels as well as 1020, 1040, 4130, 4140, 4340, 4620, 4650, and 6150 alloys—of which the 1020 and 1040 steels are now most prominent.

These materials are purchased as billets with varied lengths and diameters for use in accordance with the quantities of steel that will be required to forge rings with different dimensions.

### Birth of a Ring

When the material requirements for a given ring have been computed, billets with an appropriate diameter are cut to suitable stock lengths with automatic-saw equipment. Operation of the saw involves use of a photo-electric cell to assure precision cutting for mass-production requirements.

Stock materials are next heated, upset, and formed into steel "doughnuts" with more or less conventional furnace equipment and a Chambersburg forming hammer with a capacity of 8,000 pounds. The doughnuts are center-punched so that they respectively can



**BILLET IS FIRST CUT OFF from a shaft of proper material, on automatic hacksaw. This slug is the first step in ring-making.**

be mounted on mandrels, diameters of which range from 5″ to 8½″.

Punched stock for small rings may require no further heating before rolling operations take place. Larger stock elements are reheated before they are mandrel-mounted so that they will have the plasticity required for the most efficient roll-forming operations.

In any event, the mandrel on which stock is mounted goes to a specially-designed forging press where the mandrel ends are positioned over rollers on a pair of vertical hydraulic rams. Uniform pressures from the rams next cause the stock to contact a roll-forming assembly, so that the stock can be rotated and extruded into the desired ring.

Stock rotations are initially slow, since this assures true inner and outer surfaces for a finished ring. Then, as the wall thickness of the stock is reduced, rotational speeds are increased so that the flow of heated metals will swiftly attain the desired ring dimensions.

This rolling process is classed as "forging," because it involves the use of compressive forces. However, it might also be described as an "extrusion" technique because it involves the application of directional movements which align metal molecules around the circumference of a ring—instead of scattering the particles in a "Christmas-tree" pattern, as would the blows of a conventional forging press or hammer.

Curiously enough, the width of a roll-forged ring is only slightly greater than the width or length of its "doughnut" prefab—probably due to the centripetal forces that are created by rotating heated stock materials in the previously-described manner.

Finished rings are usually characterized by a slight concavity on the inner and outer diametrical side faces. This is not an undesirable discrepancy in most rings, but can be corrected if necessary with a final hammer-forging or machine-cutting operation.

### Tempering, Machining, Inspecting

Roll-forged rings are tempered with furnace equipment to meet varied customer specifications. Cleaning is usually done with Roto-blast facilities. Machine-cutting operations, designed to add final details such as gear teeth to the rings, are normally accomplished with customers' or subcontractors' facilities.

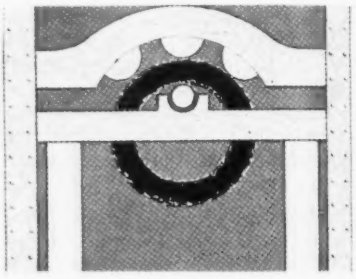
Inspections made with ultrasonic reflectoscopes, X-ray machines, magnaflux equipment, Dy-Chek solutions, etc., have thus far disclosed no "hidden flaws" in roll-forged rings—although slight Christmas-tree grain patterns have been noted where it was necessary to correct the aforementioned concavities with final hammer operations.

### Economy of Metal Stock

A spectacular example of the savings that can be achieved through the use of rolled rings was recently provided by a customer in the aircraft industry, whose specifications previously necessitated the use of machine-cutting operations to convert a 28-pound piece of stainless steel into an 8-pound ring (since cast and hammer-forged rings lacked the required physical properties); for, in addition to yielding rings of adequate quality, the roll-forging process reduced production-time requirements by a margin of 25% and saved the cost of 18 pounds of stainless steel per ring by permitting each ring to be made from a 10-pound billet.

Production of these rolled rings closely approximates finished size, which accuracy eliminates from 25% to 50% of the machining costs usually required on hammer-forged rings.

Rings and sleeves produced by this process are also in use as flywheels, gears, oil well fittings, gear raceways for traveling concrete mixers, and turret raceways on tanks. They are used in jet propulsion motors, water well casings, oil cracking plants, and installations for capping fractured oil wells.



**FINALLY, IT IS ROLLED OUT on a machine that combines hydraulic pressure with rotary motion and generates a perfect ring to the specifications required.**

Although this roll-forging process has been a theoretical possibility for years, and well-known in engineering circles, C. B. S. Steel & Forge, Inc., at 3321 E. Slauson Ave., Los Angeles, is believed to be the only commercial organization that has successfully developed equipment for such work.

That firm is typically Western, only ten years old but with 48 employees and 40,000 square feet of plant space. Their efforts in roll forging began about five years ago, but were unsuccessful prior to 1949. Then the firm's chief engineer, Tom Bright, conceived and designed the first practical roll-forging press.

**THEN IT IS PUNCHED THROUGH and made into a "doughnut" shape, on this Chambersburg forming hammer. Billets are heated before being punched. Small "doughnuts" may be reheated before further treatment; larger ones reheated to provide plasticity.**

# Packaging is my Specialty!

Photo by Josef A. Schneider

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# NEW TYPES, USES OF ALUMINUM ALLOYS

## Range of artificial aging extended; jet engines create pressing demand for high temperature properties; casting alloys popular

Resumé of a paper by *E. H. Dix, Jr.*, Assistant Director of Research, Aluminum Company of America

*Artificially aged alloys.* These wrought aluminum alloys for structural members of airplanes were the greatest legacy handed down to industry from World War II. Although originally largely limited to alclad sheet, corrosion resistance of even nonclad products is now considered satisfactory, provided there is a well-selected aging treatment. Artificial aging of certain products with thick section which cannot be quenched fast enough to give maximum corrosion resistance assures greater resistance to corrosion and stress corrosion.

It increases transverse properties of thick extrusions, but decreases longitudinal strength. Hence artificially aged 24S aluminum alloys extrusions have not seen great use.

*Aluminum-zinc magnesium alloys.* Alcoa 75S was first commercially produced for alclad sheet and extrusions in 1943, later for nonclad sheet, wire, rod and bar, and forgings. Artificial aging after solution heat treatment required to develop its final properties. Although it has a high ratio yield to tensile strength and relatively low elongation, tensile yield strength is nearly 50% greater than naturally aged 24S.

*Fatigue strength.* Greater attention must be paid to the fatigue requirements of structures employing the higher strength materials, because neither the aluminum-zinc-magnesium alloy nor the other artificially aged products have an increased fatigue strength comparable to their high static strength. Particularly true where notches exist, as found in most structural assemblies.

*High-strength alclad sheet.* Avoids much protective painting and anodic treatment. Also permits modified quenching procedures which minimize distortion of formed parts. Reynolds has a sheet product R301, consisting essentially of a core of 14S alloy clad with a magnesium-silicide alloy, and formerly had R303, an alloy of the aluminum-zinc magnesium type.

*High-temperature applications.* Use of jet engines has caused a pressing demand for aluminum alloys with improved high-temperature properties, including fatigue and creep, but they are not yet available for efficient use above 400° to 500° Fahrenheit. The best metal so far seems to be a British alloy RR58 (Cu 2.2, Mg 1.6, Ni 1.1, Fe 1.1, Si<O; 25%), but it has only been used in the United States in one type of jet engine, of British design.

*Composition of Wrought Alloys for Elevated Temperature Service*

| Al'oy | Cu | Mg | Ni | Pb | Others |
|---|---|---|---|---|---|
| 18S | 4.0 | 0.6 | 2.0 | | |
| A18S | 4.0 | 0.6 | 2.0 | 0.4 | 0.4 Bi |
| B18S | 4.0 | 1.5 | 2.0 | | |
| 32S | 0.9 | 1.1 | 0.9 | | 12.2 Si |

*Low-temperature applications.* Aluminum alloys do not lose mechanical properties in temperatures as low as that of liquid nitrogen, consequently are eminently suitable for equipment operating at sub-zero temperatures.

*Trends in aluminum casting alloys.* Aluminum-copper-silicon alloys are increasingly popular for sand and permanent mold castings. Alloys of the 319 type are being used extensively. D132, new permanent mold alloy, very satisfactory for automotive pistons. Copper and higher silicon contents than the older alloy 85 are included in two new die casting alloys, 380 and 384.

*Die Casting Alloys*

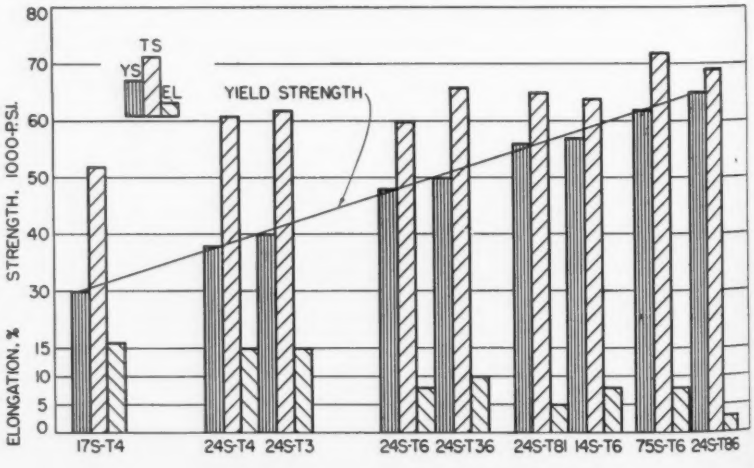
| Alloy | Cu | Si | Mg |
|---|---|---|---|
| 13 | | 12.0 | |
| 43 | | 5.0 | |
| 85 | 4.0 | 5.0 | |
| 218 | | | 8.0 |
| 360 | | 9.5 | |
| 380 | 3.5 | 9.0 | |
| 384 | 3.8 | 12.0 | |

*Composition of Casting Alloys*

| Alloy | Cu | Si | Fe | Mg | Others |
|---|---|---|---|---|---|
| 43 | | 5.0 | | | |
| 122 | 10.0 | | 1.0 | 0.2 | |
| D132 | 3.5 | 9.0 | | 0.8 | 0.8 Ni |
| 142 | 4.0 | | | 1.5 | 2.0 Ni |
| 195 | 4.5 | 0.8 | | | |
| B195 | 4.5 | 2.5 | | | |
| 214 | | | | 3.8 | |
| 220 | | | | 10.0 | |
| 319 | 3.5 | 6.3 | | | |
| 355 | 1.3 | 5.0 | | 0.5 | |
| 356 | | 7.0 | | 0.3 | |
| A612 | 0.5 | | | 0.7 | 6.5 Zn |
| C612 | 0.5 | | 1.0 | 0.4 | 6.5 Zn |

For uses where good strength and ductility are essential, two heat treatable alloys, 355 and 356, are favored. The latter is also suitable where corrosion resistance is required. Foundries not having heat treating facilities use aluminum-zinc-magnesium alloys of the Frontier 40E type (Zn 5.5, Mg 0.6, Cr 0.5, Ti 0.2%). These

**Tensile properties (specification values for 0.064-in. Alclad sheet) for aluminum alloys of high strength. YS = yield strength; TS = tensile strength; EL = elongation.**



do not require heat treatment, but sometimes are artificially aged.

Several new modifications of the 214 alloy type give improved appearance after anodic treatment. Other new alloys contain about 6% to 7% magnesium. Where higher strength and ductility is needed than more easily cast alloys can provide, the die casting alloy 218 (8% Mg) is used.

*New clad products.* In the form of sheet, pipe and tubing they have permitted the aluminum industry to compete for industrial roofing, condenser tubes, barrels for beer and chemicals, and similar applications. Buildings of new architectural design are now being faced with a clad product having a silicon alloy surface which takes a pleasing dark color after anodizing.

*Magnesium-silicide alloys.* 63S suitable for many applications because of excellent extrusion characteristics, high resistance to corrosion and bright appearance after anodic treatment. Because of latter two qualities, it has largely replaced 53S for architectural purposes. First two qualities make it important for quantity production of portable irrigation pipelines. 61S has higher strength than 63S and has largely replaced 53S for structural use where good resistance to corrosion is essential.

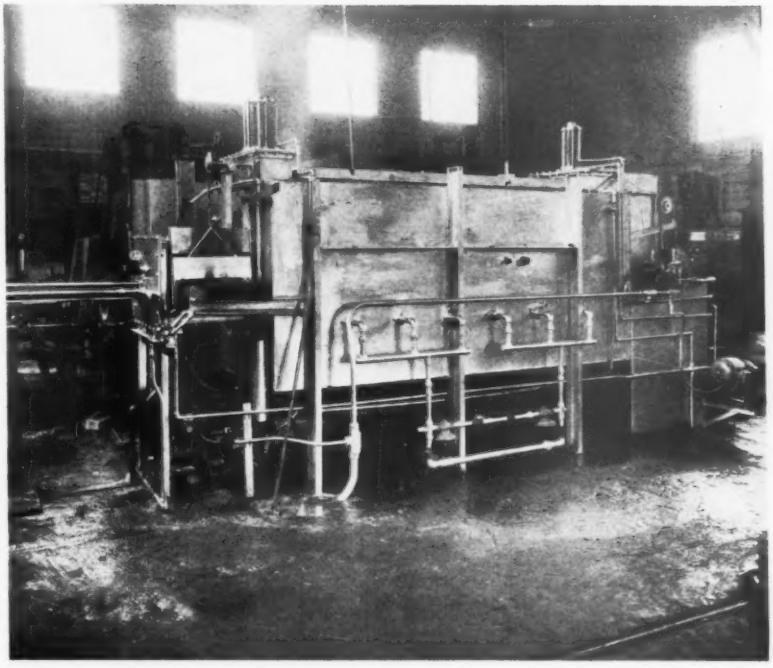
Examples are railroad tank and hopper cars, canoes and other pleasure craft, lifeboats, superstructures on ships. Also desirable for welded structures and welding, since its resistance to corrosion does not decrease when welded. A temper giving ratio of tensile yield strength to ultimate strength less than 80% is used for railroad cars. For tubing and wire, great increase in strength is provided by new tempers achieved by substantial cold working either before or after artificially aging the solution treated alloy.

*Composition of Wrought Magnesium-Silicide Alloys*

| Alloy | Mg | Si | Cu | Cr |
|---|---|---|---|---|
| A51S | 0.6 | 1.0 | | 0.25 |
| J51S | 0.7 | 0.4 | 0.25 | |
| 53S | 1.3 | 0.7 | | 0.25 |
| 61S | 1.0 | 0.6 | 0.25 | 0.25 |
| 62S | 1.0 | 0.6 | 0.25 | 0.10 |
| 63S | 0.7 | 0.4 | | |

*Aluminum-magnesium nonheat-treatable alloys.* Are becoming more varied in composition. Kaiser Aluminum & Chemical Corp. has an alloy 150S containing approximately 1.4% magnesium, with properties intermediate between 3S and 4S, but has brighter color after anodizing than either of these two because it has no added manganese. Other aluminum alloy manufacturers also have sheet of


# "Cyanide" HARDENING WITHOUT CYANIDE



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the 1¼% magnesium type. Alloys with magnesium content of 3½% to 5% magnesium are desirable for welded parts, especially for inert-gas-shielded arc welding which requires no flux, since these alloys do not require heat treating for strength.

*Brazing alloys.* Suitable fluxes for brazing make aluminum alloy assemblies competitive with other metals. For severely corrosive conditions, aluminum alloys with 5% to 12% silicon are the preferred filler materials. By adding copper, or both copper and zinc, to an aluminum-silicon alloy, brazing alloys with lower melting points become available.

Nonheat-treatable 3S is the most commonly used wrought alloy, and as brazing fully anneals it, 61S and J51S alloys of the magnesium silicide type can be used for higher strength assemblies, and the assemblies can be quenched from the brazing temperature (thin sheet can be cooled by air blast) and artificial aging afterward will give maximum strength. 61S and J51S require lower brazing temperature than 3S. If the brazed assembly includes casting, alloys of the aluminum-zinc-magnesium type are better because of higher melting point.

*Composition of Nonheat-Treatable Wrought Alloys*

| Alloy | Mn | Mg | Cr |
|---|---|---|---|
| 2S | 99.0% min. aluminum | | |
| 3S | 1.2 | | |
| 4S | 1.2 | 1.0 | |
| 52S | | 2.5 | 0.25 |
| 56S | 0.10 | 5.2 | 0.10 |

*Composition of High-Strength Wrought Alloys*

| Alloy | Cu | Mn | Mg | Zinc | Others |
|---|---|---|---|---|---|
| 14S | 4.4 | 0.8 | 0.4 | | 0.8 Si |
| 17S | 4.0 | 0.5 | 0.5 | | |
| A17S | 2.5 | | 0.3 | | |
| 24S | 4.5 | 0.6 | 1.5 | | |
| 25S | 4.5 | 0.8 | | | 0.8 Si |
| 75S | 1.6 | | 2.5 | 5.6 | 0.3 Cr |
| 76S | 0.6 | 0.5 | 1.5 | 7.6 | |

Using clad products, such as a brazing sheet with a core of either 3S or a heat-treatable magnesium-silicide alloy clad on one or both surfaces with a suitable brazing alloy, eliminates the need to locate separate pieces of the filler alloy in the assembly.

*Aluminum alloy bearings.* First big use of permanent mold cast aluminum bearings was in diesel engines because of their high fatigue resistance, satisfactory embeddability and a good resistance to the corrosive action of organic acids developed by the oxidation of lubricating oils. Now approved for main, cam, and auxiliary drive shaft bearings on aircraft engines.

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# JOINING TO CREATE INSEPARABLE PARTS

**Copper furnace brazing does not jeopardize assembly by use of pins, bolts or rivets, and alloy process makes joint homogenous**

BECAUSE of its value, copper furnace brazing is fast becoming one of the favored methods of metal joining. A brief and understandable discussion of equipment necessary to accomplish the desired results follows:

*Manual Pusher:* The pusher or batch type furnace is as the name implies. Parts or assemblies are loaded or placed on metal trays which are pushed into the heat zone. When parts and tray come up to the brazing temperature another trayload is pushed against it and the first tray is thus forced into the start of the cooling chamber.

This operation being repetitive, we have finished parts emerging from the discharge door. The periodic movement of the loads and the relationship in size of trays to the heat zone permits the inner doors to be closed, thereby insuring correct atmosphere and heat at all times.

*Roller Hearth:* The roller hearth furnace is the first progressive step forward in the design of furnaces for this process. The biggest difference between the manual pusher and the roller hearth is the motivation furnished and installed to propel trayloads of assembled parts through the brazing cycle. This type of furnace has a series of rollers installed from end to end, and trays are propelled through the heating and cooling zones by means of these rollers.

By

GEORGE F. BROWN

Sales Engineer
Fabriform Metal Products, Inc.
Los Angeles
Calif.

*Mesh Belt Conveyor:* The mesh belt conveyor furnace is considered the nearest approach to a production machine. Movement of the belt provides control of uniformity during the brazing cycle. Assembled parts are placed directly on this heat-resistant belt, where they move through the heat zone and cooling chamber. The speed of the belt being adjustable allows for any difference in the weight of parts or assemblies, and assures slow progress through the heat zone. This slow progress will eliminate any possibility of heat shock, thereby preventing warpage and distortion.

The various types of furnaces used for copper furnace brazing are heated electrically. This assures proper control of temperature so necessary in the process. Generally furnaces used for copper furnace brazing are designed somewhat similarly.

### Reducing Atmosphere

Copper furnace brazing requires proper reducing atmosphere. The two go hand in hand, and it has been discovered that the correct constituents must be contained in this atmosphere to properly perform copper furnace brazing. The prevalent atmosphere in use today for brazing is produced by the partial combustion of natural gases.

These admixtures are introduced into the furnaces in accurate quantities, so as to exclude any oxygen entering the furnace during these brazing cycles. When the atmosphere is correct, parts come from the furnace clean and with all surfaces bright.

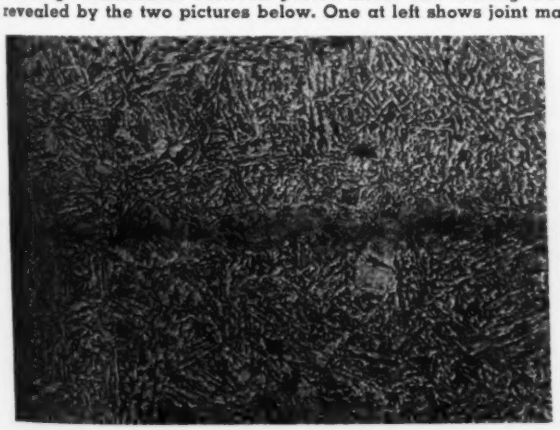
### Heat Treating

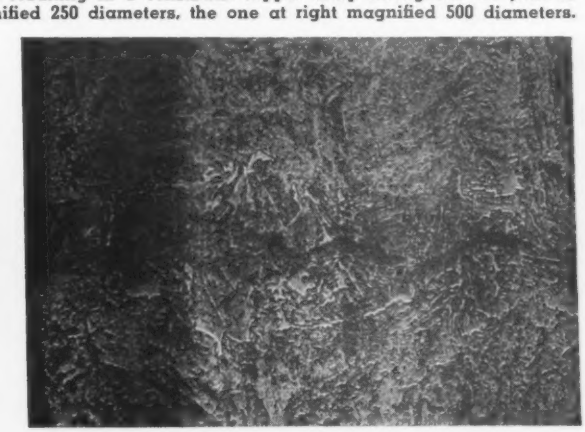
When parts or assemblies are produced from heat-treatable stock, heat treating after copper furnace brazing will improve the physical properties. A large number of the brazed assemblies are heat treated after they are brazed. The strength of copper furnace brazed joints after heat treatment is generally improved providing parts are fairly uniform in section. Quench-stresses do not occur during the quick cooling in the quench.

When parts are discharged from the furnace they are ready for any subsequent work necessary to them, be it plating, painting or any other type of finish desired. Parts are clean and bright and the surface is free from any scale.

Copper furnace brazing is a modern

**Thorough transfusion between parent metal and brazing metal, resulting in a consistent copper alloy throughout the joint is revealed by the two pictures below. One at left shows joint magnified 250 diameters, the one at right magnified 500 diameters.**





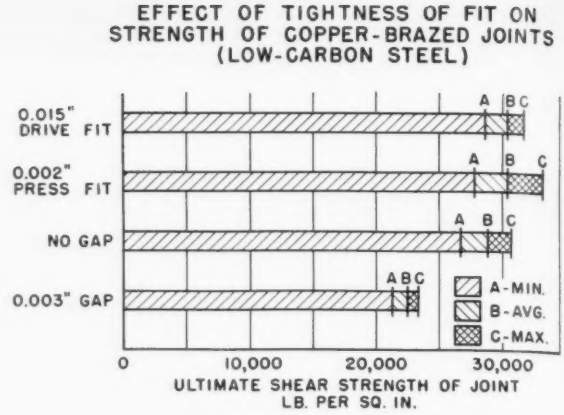
production method which has proven its value in that it is economical in several ways. Material labor and ultimate parts costs make it a valuable design feature.

In the fabrication of parts that are to be brazed, nominal tolerances are usually satisfactory. When parts are to be copper furnace brazed, an effort should be made to have a snug metal-to-metal fit. This not only will assure strong joints but will also alleviate any movement of the parts during the brazing operation.

### Question of Tightness

There is no limit to the tightness of joints for copper furnace brazing, but the difficulties encountered make it most impractical to have parts too tight. When parts are made too tight a press fit, they may be damaged in the assembly of parts in preparation for the brazing cycle. They also require a longer heating period to braze, creating stresses and distortion during the brazing process and there is no gain in strength.

A very satisfactory rule to follow in the design of parts for copper furnace brazing is to allow a maximum of .001″ press fit per 1″ of diameter. When this rule is followed, parts can be assembled without any damage and are self-sustaining during their travel through the furnace.




**Results of a series of tests determining strength of copper furnace brazed assemblies. Shear strength of 23,000 to 33,000 psi., depending on fit of 0.003" gap to 0.002" press fit as shown.**

### "Brazing" a Misnomer

The high strength obtained by copper furnace brazing is usually compared to ordinary brazing and soldering by the average layman, and brands the word "brazing" a misnomer. The average person looks on the process of brazing as the makeshift of "pasting" of parts together to accomplish a repair job on broken parts. Because of the alloying action between the parent-metals and copper, and the flow of the copper through mating parts, the entire joint becames homogeneous.

The uniform and gradual rise in heat makes it possible to join light with heavy parts or to join dissimilar metals. Decarburization of parts, which was a definite problem, has been overcome by the cooperation of the designer and the party doing the brazing.

This comparatively new method of metal joining is the only process which does not jeopardize the entire assembly by the use of pins, bolts or rivets.

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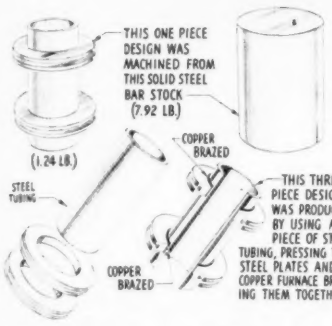
Above (left) four parts brazed together. At right, gun mount parts: upper, after forming, below, mating part ready for assembly and brazing together.


THIS ONE PIECE DESIGN WAS MACHINED FROM THIS SOLID STEEL BAR STOCK (7.92 LB.)
(1.24 LB.)
COPPER BRAZED
STEEL TUBING
THIS THREE PIECE DESIGN WAS PRODUCED BY USING A PIECE OF STEEL TUBING, PRESSING TWO STEEL PLATES AND COPPER FURNACE BRAZING THEM TOGETHER.
COPPER BRAZED

1,000 lbs. of steel and 60% machining time saved in day's operation on one job.

Pressure pot of five components (1) shell; (2) head; (3) flange; (4) suction tube; (5) suction tube connector. Also heat treated.

A bolted flange, for example, is no stronger than the bolts holding it. When the parts are copper furnace brazed they are practically inseparable.

The joining of parts such as stampings, forgings and screw machine products is accomplished in electrically heated furnaces at a temperature usually ranging from 2,000° F. to 2,100° F., and in the presence of a controlled atmosphere.

Copper furnace brazing consists of heating the assemblies in controlled reducing atmosphere above the melting point of the copper, and cooling of the assemblies in the same atmosphere to a temperature at which parts will not scale or oxidize in air upon removing from the cooling chamber.

Much has been said and written about copper furnace brazing. Photos showing various parts and described briefly will tell more than technical papers.

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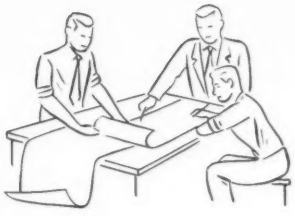

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More and more manufacturers and users of metal tools are finding that this process reduces their costs in a number of ways. For example, a part that has been hard-faced carefully and with the proper alloy, has a longer service life than an unprotected part.

Depending upon the alloy used and the service conditions affecting that part, hard-faced surfaces will outwear unprotected surfaces from two to 25 times—and more.

When parts must be both hard and tough, frequently hard-facing is the only answer. One alloy may not satisfy both those qualities, so the part becomes in reality a combination of metals fused together.

Take, for instance, a concrete drill. Its "biting teeth" must be hard; its body must be tough. To make the entire drill head from a specially hard alloy would involve prohibitive expense. To make the entire drill head of a specially tough alloy would not suit the purpose, since the working surfaces would become dull in no time at all.

Optimum result is a combination of the two metals, by hard-facing. The drill body would then be made of a tough metal, whose purpose would be to hold the drill cutting surfaces. Drill cutting surfaces would be made of a specially hard alloy designed for the purpose of chewing up concrete. Those cutting surfaces would be fused (by brazing) in the right spots on the drill head. Result: a concrete drill with definitely superior qualities and less cost.

Hard-facing, of course, robs the scrap pile of many parts that would normally be sent there. Now they can be salvaged and returned to heavy-duty service at a fraction of their original cost. Parts can be thus rebuilt again and again, if necessary—as long as the part body remains capable of holding a hard-facing alloy. For that very reason, inventories of new stock parts kept on hand can be cut down.

Another by-product advantage of hard-facing is that parts are kept in better condition. When a part begins to wear, its effectiveness as an individual producing unit is usually lowered. Output and efficiency of the equipment in which that part is operating, are at the same time decreased. More power is needed to drive the machine in order to get the same or poorer operating performance.

A little intelligent application of hard-facing principles will overcome many of your plant production troubles in the days to come—particularly when you will not have available everything you would like, and when you will have to do the job without easy accessability of new replacement parts.

Further information and necessary equipment for hard-facing can be obtained from welding equipment dealers and distributors.

### COLUMBIUM
### resists jet-eng. temperatures

COLUMBIUM is one of the most recent elements to find use in the steel industry. It was used commercially as an alloy in the 1930's although experimental work had been done with it as early as 1920.

Because of the strategic applications of columbium bearing steels, the United States Government has ordered that ferrocolumbium—the alloy of columbium and iron consumed in steel furnaces—shall be used only for orders vital to national defense.

Some columbium bearing steels can withstand high temperatures of 800-1650 degrees F. for long periods of time without becoming susceptible to a weakening condition called "intergranular corrosion." Jet engines depend on this metal.

### COBALT
### makes industrial superalloys

COBALT, the first strategic metal to be placed under virtually complete government control because of the military requirements, is an increasingly important element in making special alloy steels. Because this tough, silvery white metal is used in such critical items as jet engines, gun barrel linings and radar, purchases of more than 25 pounds must have government approval.

"Superalloys" also containing tungsten, chromium and molybdenum, constitute the most rapidly expanding use of cobalt. Permanent magnet steels, such as those used in radio and television speakers and in radar equipment are the largest single consumers of the element. Porcelain enamel coatings for steel also contain cobalt. Additional cobalt is used by the steel industry in cemented carbide dies for cold drawn bars and wire, and in hard facing for dies. An essential property of the element is its heat resistance.

A cobalt deposit near Salmon, Idaho, may yield much of this metal.


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Actual photo of poor casting surface that may be eliminated with engineered sand.

# SAND ENGINEERING—
# An Innovation for Foundry

**Properties and composition of your molding sand have quite an influence on final quality of steel castings your plant turns out**

SAND ENGINEERING, a new concept in the steel castings industry, marks the first really basic technological advance in foundry science since the advent of the electric arc furnace. It is fast leaving the laboratory research stage in favor of commercial application.

Practical application of this science as a foundryman's tool is ever growing. Sand Engineering is the science which deals with molding materials, their composition and properties, and mainly the influence which they have on casting quality.

Emphasis in foundry metallurgy has uniformly been placed on metal. Complex behavior of metal in multiple operations of a steel foundry is a constant challenge to the engineer searching for precise mathematical relationships in his attempt to improve the quality of steel castings.

### Key to Casting Quality

Most foundry metallurgists now recognize that emphasis must shift in substantial degree toward molding sand. Control of molding sand constitutes the real key to casting quality.

Silicon dioxide ($SiO_2$) has carried the major load as the principal foundry sand ingredient; it is doubtful that any deviation from this chemistry will receive consideration for the next several years.

Recently the oxide of zirconium has found limited foundry application. However, zirconium sands suffer several disadvantages in direct competition with silicon, probably the most important being the very high first cost of this material.

Silicon dioxide, known to the foundryman as "silica," is of primary importance in all foundry sand mixes as the largest "percentage-by-weight" constituent because of its high refractoriness and indestructability upon exposure to molten steel temperatures.

By
DON ROSENBLATT
American Foundry & Machine Co.
Salt Lake City
Utah

All other materials added to silica to modify its properties tend to reduce its refractoriness and render it less desirable from this standpoint. If it were in any way possible to hold pure silica together in the mold form, the optimum with regard to sand chemistry would be obtained.

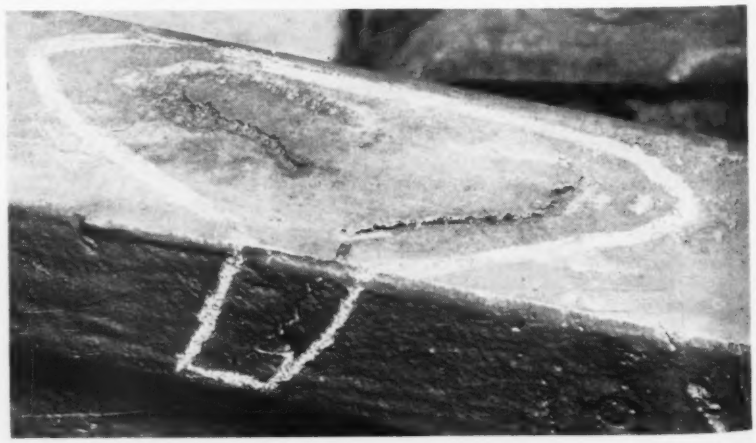
In actual practice, complex eutectics have of necessity replaced pure silica in order to achieve such important physical properties as green strength, baked strength, collapsibility, flowability, etc.

Using silica as the foundation, molding sands are synthetically constructed out of such addition agents as corn flour, bentonite, fire clay, dextrin, molasses, iron oxide, gilsonite, seal coal, and a host of other materials including several proprietary addition agents sold under a variety of trade names.

The ideal sand is that which will meet necessary physical requirements with the least amount and variety of addition agents. It will then have the lowest cost with respect to both money and refractories.

Prior to any intelligent inquiry into the effects of various addition agents it is necessary that some understanding of the physical requirements of molding sands be obtained through a close scrutiny of the mold-metal rela-

Photograph of a typical defect in a run-of-the-foundry production casting. It is just this sort of difficulty that Sand Engineering seeks to help eliminate.



tionship. There have been many different opinions as to the physics of this problem, but it is generally accepted that the sand mixture must be:

a. Porous enough to permit the escape of gases formed during the pouring operation.
b. Of sufficient deformation to permit elastic strain without cracking.
c. Of sufficient hot strength to hold the given weight of molten metal.
d. Of rapid enough collapsibility to prevent hindered contraction of the solidifying casting.
e. Of sufficient green strength to permit the molding and pattern drawing operations.

While there are some additional qualities necessary in good foundry sand, they are of no basic significance —assuming the above conditions are met in using a highly refractory material. Therefore the physical properties with which we are primarily concerned can be expressed quantitatively in terms of permeability, green strength, deformation, hot strength and collapsibility time.

When these properties are brought into exact balance for a given casting, a high quality casting can be consistently produced, and the specific function of sand engineering becomes the means for determining and arriving at that balance.

### Castings by Groups

Theoretical considerations soon lead the sand engineer to the conclusion that each different casting is a separate problem which will require a specific sand according to the principles of sand engineering. This would of course be impractical from a production standpoint where a large variety of castings is involved.

A compromise procedure permits classification of castings into fairly broad groups with an engineered sand to meet the requirements of each group. Group classification is made on the basis of casting weight and design, including the number, shape and size of sand cores employed in producing the casting.

Cores are of paramount importance since they represent the mold areas which are most completely surrounded by molten metal during pouring. In most castings the mold may be divided into major sand components as follows:

1. The facing sand.
2. The backup sand.
3. The core sand or sands.

The group classification system which subdivides these primary sand mold components is concerned largely with the core sand or sands, to a lesser extent with the facing sand, and to a still lesser with the backup sand.

*Continued on page 76*

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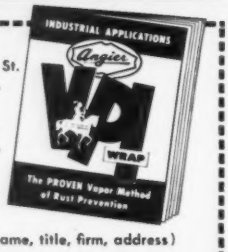


(USE MARGIN for name, title, firm, address)


*Continued from page 75*

The first group classifications are therefore predicated on cores. Groups are formed in the following manner:

| | |
|---|---|
| GROUP I | Cores from 0″— 1″ thick. |
| GROUP II | Cores from 1″— 2″ thick. |
| GROUP III | Cores from 2″— 3″ thick. |
| GROUP IV | Cores from 3″— 4″ thick. |
| GROUP V | Cores from 4″— 5″ thick. |

and so on up to any practical maximum thickness.

These groups must be modified to accommodate various thicknesses of surrounding metal which have a pronounced effect on optimum physical properties of the core. Modification may be represented as follows:

A. Metal thickness 0″— 1″.
B. Metal thickness 1″— 2″.
C. Metal thickness 2″— 3″.
D. Metal thickness 3″— 4″.

and so on up to any practical maximum thickness.

Within the framework of the above system any core will fall into a given classification such as IA, IIC, IIIA, etc. Each of these classifications will require a given set of physical properties to meet mold conditions ideally.

However, laboratory work has shown that many groups require sets of physical properties similar enough quantitatively so that the number of groups may be reduced to about six to handle core sizes up to 15″ and metal thickness up to 10″, covering most steel casting requirements.

For example, a IA core and a VE core will both have optimum properties from a single mix. Similarly a IIB and a IIIC core may be made of this same mix.

Just how this has been determined requires an understanding of calculations concerned with hot strength and collapsibility as determined experimentally and checked wherever possible by thermal and strength of material engineering formulas. The significant point is that such work has provided a sound basis for making sand mixes to certain physical specifications.

Group classifications for backup and facing sands have been established and refined in a manner similar to the procedure given for core sands, and here again the groups have been reduced to a practical operating number.

### About Addition Agents

We are now in a position to return to the evaluation of addition agents from which we can synthesize a sand that will meet certain physical specifications for a given group classification. This constitutes the second phase of Sand Engineering.

Empirical effects of various additions have long been known. In sand engineering, the efficiency of each ad-

dition agent is determined by experimental and mathematical means. An evaluation program for any variable can easily determine the minimum number of mixes necessary to establish quantitatively the optimum efficiency for any ingredient.

This is done by plotting the complete range of data for a given addition into linear graphs on semi-log paper for each property under consideration. In this manner sand mixes may be engineered so that the greatest possible benefit is obtained for each additive used.

Where addition agents compete in efficiency affecting physical properties, the decision as to which agent is to be preferred must be made on the basis of cost and availability comparisons.

Most ingredients used in engineered sands have been in use for a number of years. Thus, the tremendous improvements realized in castings through use of engineered sands must be largely attributed to a correct balance of ingredients formerly used rather than to any startling effects of newly devised ingredients.

### Phenolic Resin Binders

There is, however, one significant exception to the foregoing statement, namely, the comparatively recent application of phenolic resin binders in foundry sand mixes.

Resin binders are finding a wide acceptance in the industry as a replacement for core oils. Core oils have long been used to confer high baked strength in core sand mixes.

This is accomplished by an oxidation of the oil at core baking temperatures (350° F.—450° F.) which serves to bind the sand grains and give cores a high hot strength concomitant with adequate collapsibility.

Core oils are of several kinds and bases. Usually a linseed oil base is used due to the need for a high saponification number oil. Linseed base oils are expensive and require long baking periods to develop maximum properties.

Phenolic resins have been found more potent than linseed base core oils —they require considerably shorter baking cycles, lower temperatures and are far less expensive than oils. The baking period with phenolic resin sands is reduced to only a drying operation; once the water is driven off resin action is complete.

Ability of resins to confer tensile strength on core sand mixes quickly at relatively low temperatures has led to some interesting investigations that hold high promise for the future of foundry sand technology.

Resins have been found to reproduce results at a higher consistency than oils, and for this reason they are sensitive to sand engineering methods to which the oils have not responded.

On the night of February 6, 1909, Baekland announced the discovery of the first practical phenolic resin to the Chemists' Club in New York. The advancement in plastics technology since that night has been nothing short of phenomenal in scores of industries. It is probably safe to predict that by 1959 the 50-year development of phenolic resins will find the foundry industry using resins on a 100% basis in core sands.

To be meaningful, any discussion of Sand Engineering must include a word of caution. New ideas and methods can not be dropped on the foundry *per se* without danger of resistance which might easily yield disastrous technological setbacks.

### Function of Sand Engineering

Much of the Sand Engineering concept will be entirely foreign to operating personnel. Sand Engineering must be integrated into the foundry operation by trained sand engineers. Such integration embodies a close cooperation between technical and oper-

*Continued on page 92*


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# NEEDED:
# A SIMPLIFIED SYSTEM OF MARKING ALLOY STEELS

**THERE ARE approximately as many different systems of marking alloy steel as there are producers, jobbers and users. The reasons for this are a combination of established practice, an uncoordinated maze of specifications, and rugged individualism. Immense amounts of time and material are wasted annually because there is no universal system of marking alloy steels. Efficient utilization of our steel resources is essential at any time; in the event of mobilization for war it would be imperative.**

**Current identification practices have resulted in extreme tonnages of alloy steels being lost to production as a result of lost identification. The material losses in surplus after World War II were beyond the ability of our national economy to absorb. It is therefore apparent that the application of the proposed marking techniques would contribute to the efficiency of our national conservation program.**

**The following discussion of this problem is an attempt to state the facts regarding this condition in the belief that a coordinated effort on the part of producers, jobbers and users can result in mutual benefits.**

A SURVEY was made recently of the marking methods employed by various users of alloy steels. Tool and gear manufacturers, municipal engineering departments, steel jobbers, specialty manufacturers and aircraft manufacturers were among the groups surveyed.

This survey, completed by Western Regional Inspection Committee, Aircraft Industries Association, revealed that many manufacturers of steel products do not have sufficient machine tools to do all of their own work. As a consequence, many small shops are employed in the manufacture of specialized steel products. A great number of these sub-contractors do work for different manufacturers.

Imagine the problem confronting a small machine shop sub-contracting to two or more manufacturers, receiving alloy steels of the same basic specification from each with entirely different markings.

It is frightening to note that one user will mark a certain alloy steel in exactly the same way as that employed by another user to mark an entirely different steel.

The aircraft industry is a good example of the way users of alloy steel mark their material. Six different major airframe contractors were surveyed. Six different methods of marking steel were discovered. These systems exhibit absolutely no similarity. There are obvious disadvantages in such a condition.

Although the aircraft industry uses a very small portion of steel consumed by U. S. industry, proper identification of the steel it does use is of extreme importance.

It is imperative that steels used in aircaft be readily identifiable as to type and condition at all times. This is so essential that steels that have lost their identity must either be discarded or subjected to a thorough laboratory physical and chemical analysis.

In either case the problem of identification has imposed a cost that is out of all proportion to the amount of steel being used.

### Not Enough Colors

This problem is still further complicated by the fact that each jobber has his own system for marking alloy steels, usually by color coding. In many cases different colors are used to denote different conditions of the same basic steel. Manufacturers purchasing from jobbers thus find themselves faced with the necessity for

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WESTERN Regional Inspection Committee, Aircraft Industries Association, is a group of progressive-minded men who are working today for benefit of tomorrow, as this article points out. Membership consists of:

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*Denham S. Scott,* Assistant to President and *LeRoy Gaskins,* AiResearch Manufacturing Co.

*E. P. Kaiser,* Quality Manager, and *T. K. Culliton* and *W. W. McCutcheon,* Quality Manager (Wichita), Boeing Airplane Company.

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*Robert E. Dawe,* Quality Control Manager and *C. T. Aubrey,* Chief Inspector, North American Aviation, Inc.

*R. S. Catlin,* Director Quality Control and *Jack Mannion,* Chief Inspector, Northrop Aircraft, Inc.

*A. S. Billings,* Chief Inspector, and *R. L. Haver,* Ryan Aeronautical Company.

*V. G. Verschoore,* Hughes Aircraft Company.

*Ralph Ellis,* Technical Service, Pacific Airmotive Corp.

re-marking all alloy steels in accordance with their own systems.

Steel leaves a mill identified in some way or another. It is then subjected to an entirely different set of markings by a jobber, who in turn, sells it to a manufacturer who marks it again in an entirely different and unique way.

Most jobbers and some steel producers are employing complicated systems of color coding as a means of identifying alloy steels. There are not sufficient colors in the spectrum to cover every type of steel and the various conditions in which the steel is produced.

Color coding is a laborious and inefficient process and is therefore expensive. As a consequence it is one of the least desirable methods of identifying steel.

### Too Many Specifications

It is well known that steel producers are plagued with a multiplicity of specifications. In many cases individual users require individually mill-marked steel. Specifications for steels bear different numbers and require different markings for a product that is identical in other respects. It is probably also true that the smallest users of steel cause the producers the most difficulty.

On the other hand there is an almost universal feeling among users and jobbers of alloy steel that something drastic should be done about the identification problem. This is good because it opens the way for corrective action. Many good ideas never reach fruition because someone is not ready to accept them.

It is believed that the time is ripe to adopt a new system of marking alloy steel because enough users of the product are agreed that it is a necessity.

### The Time for Action!

Steel producers undoubtedly have more information on this subject than anyone else. For this reason the simplest way to deal with the problem would be for the steel proucers themselves to impose on their customers a universal method of mill-marking alloy steels.

Ramifications of such a suggestion are apparent. Many users of alloy steels would have to give up at least some of their individualistic tendencies. However, it would seem that the time for action is at hand.

Steel producers have indicated that the paraphernalia (inks, stamps, etc.) required to mark their products is available. In fact most steel producers are now overburdened with a host of marking devices necessary to produce all the varying symbols and marks required by different users. A single system for coding alloy steel should simplify the job of the mills.

### How It Could Be Done

People concerned agree that the simplest method of marking steel would be in a manner similar to that already used to mark stainless steel. Apparently this marking system was instigated by the steel producers and it should not be difficult for them to extend the use of their system.

Aluminum producers also use a very acceptable method of marking their products. Their method is similar to that used to identify stainless steels. Stainless steel and aluminum are so marked as to eliminate many of the problems that have plagued the producers, jobbers and users of alloy steels.

Continuous ink stamping of all shapes of alloy steels seems to be the solution to the problem. It is necessary that the marking system contain the manufacturer's name or symbol, the heat number, the condition, the specification and the thickness or gauge if possible.

There is no question about the fact that marking steel in such a manner would result in a considerable saving among the users. It is also believed that this method would be the simplest means of accomplishing the transition from the present system.

Placing the specification number on a piece of alloy steel immediately focuses attention on the fact that only one specification number should be used. As a consequence it is believed that the steel producers should enforce on the users of alloy steel a single standard of specifications. This would undoubtedly be of considerable benefit to everyone concerned.

At the present time it is necessary for manufacturers supplying steel products to the government to receive and have available, physical and chemical analyses of the steel used in their products. Here again a considerable amount of duplicate paper work can be eliminated if continuous ink stamping is used.

At present the producer supplies physical and chemical test reports to a jobber who is undoubtedly buying from more than one steel producer, and selling to many different outlets. Consequently, test reports must be duplicated an indefinite number of times. Continuous ink stamped steel would carry its own physical and chemical identity through the heat number and would require only that the mill retain the physical and chemical analysis of that heat. Air Force and Navy purchasers of aircraft have indicated that under such conditions they will relieve manufacturers of the necessity for securing and filing physical and chemical test reports.

**In conclusion, the following facts are evident:**

1. It is apparent that the steel pro-

## Why Alloy Steel Is Hard to Identify . . .

*Steel Mills*

Steel leaves the mill marked in one way or another. The same steel produced in different mills may be marked in a different way by each mill.

*Jobber or Warehouse*

Each jobber has his own system of marking, usually by color code. Jobber buys from several producers, receives same steel marked in different manner. Jobber also must receive and file copies of test reports for all alloy steels in stock. Keeping test reports of various steels coordinated is difficult.

*Fabricator or Manufacturer*

Manufacturers of steel products have their own systems of color coding steel. These are extremely complicated because it is necessary to indicate the condition of the steel as well as its basic type. No two color coding systems are alike. Manufacturer must receive and file copies of test reports for all steel purchased.

*Sub-Contractor*

By the time steel hits a sub-contractor it has already been marked in three different ways. Many subs do work for several different manufacturers. Retaining the identity of all steel in stock is a virtual impossibility. Frequently sub-contractors become involved and identification and segregation problems are multiplied.

*Unidentifiable Material*

During manufacturing steel may lose its identity. Cut ends, etc., are lost to further use.

By this time a piece of steel has been marked so many different ways that identification has become a complicated game. Test reports have been duplicated so many times that the cost of identifying a piece of steel has almost reached the cost of the steel.

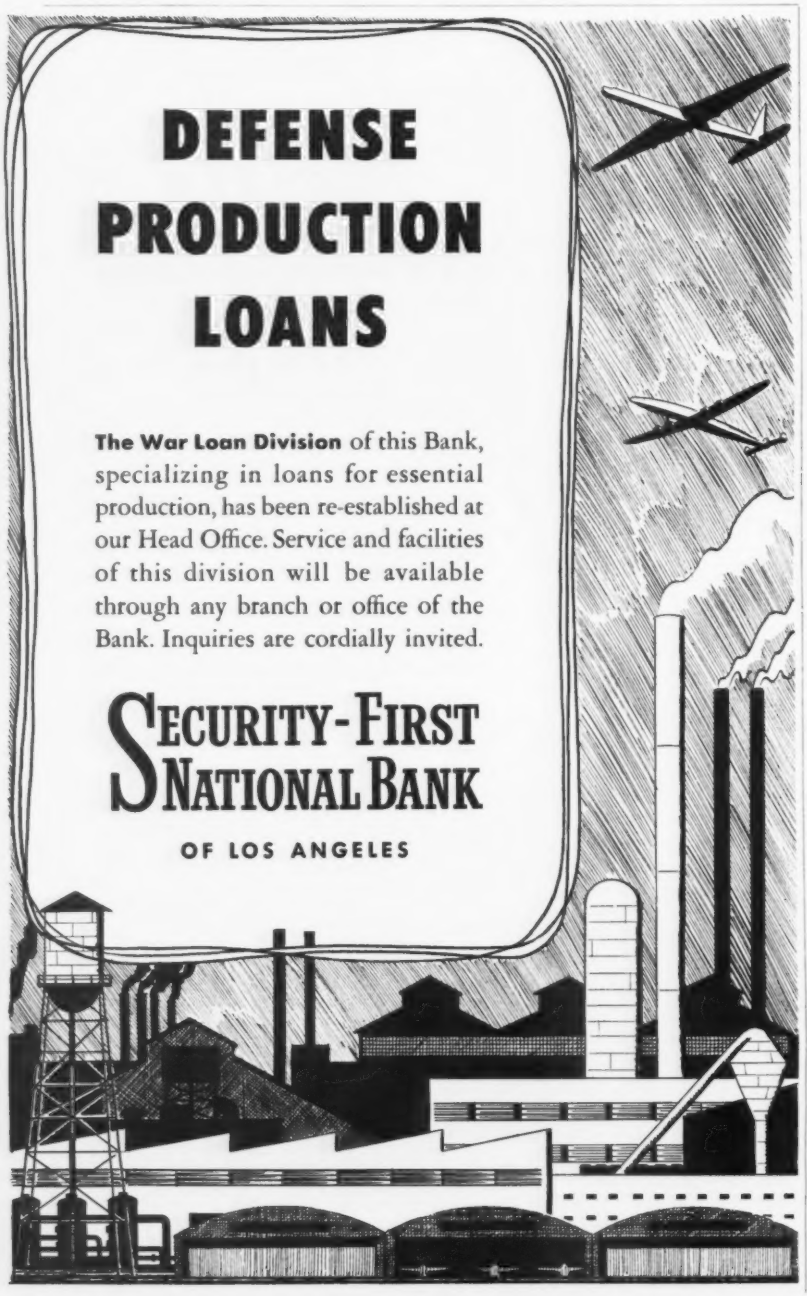
### "Birthmarked Materials" Are Easy to Identify

A piece of material can be transferred easily from one facility to another and will carry its birth mark throughout its entire life. Each piece tells its own complete history:

1. The producer's name or symbol.
2. The specification of the material.
3. The condition of the material.

ducers are best able to enforce continuous ink stamping of alloy steels on industry.

2. Continuous ink stamping of alloy steels is possible and would provide an answer to the problems.
3. Continuous ink stamping should include:
   a. The manufacturer's name or symbol.
   b. The specification of the steel.
   c. The condition of the steel.
   d. The heat number from which the steel was produced.
   e. The thickness of the steel if possible.
4. Establishment of an orderly ink printing system would effect the most facile means for an orderly transition from the present multifarious assortment of marking practices now in existence.
5. Universal and economical application of the marking medium would insure immediate and permanent identification.
6. Positive identification of alloy steel bars and tubes throughout their entire lengths would allow no margin for error in steel types.
7. Positive identification relationship between producers and end users would be inevitable.
8. Simplified national warehouse stocking methods would be established.
9. Free interchange of material between warehouse, prime and subcontractors would be expedited by an infallible system.
10. Inestimable advertising value to the producers would ensue.
11. Elimination of transfer and government source inspection relative to chemical and physical properties beyond the producers would result. This operation is presently estimated to cost ¾% to 1½% of material cost per each transfer.
12. Adoption of this program would eliminate most of the complexities shown in the report, and a more economical marking practice will have been instituted by the producers.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## TRENDS IN TOOLS . . .

. . . Continued from page 46

While the foregoing procedure has been satisfactory in so far as producing individual spot welds is concerned, there still remains an occasional assembly problem. For example, stringer to skin spot welding is a common application, but is also inclined to leave waviness in the panels between the stringers.

One method of assembly that has been used successfully to overcome this condition has been to introduce a reversed contour into the panel while it is being spot welded. This seems to have the effect of relieving, or at least equalizing, the local stresses so that when the panel is permitted to flatten out to its normal position, all evidence of waviness is gone.

### Resistance Welding

Northrop engineers have chosen resistance welding as a means of joining metals in the fabrication of their wing tip tanks. Principally, this consists of spot welding of skin to the bulkhead rings and a combination of spot welding and seam welding at skin splice joints. By choosing resistance welding as a preferred method of joining, the use of high strength 75S-T Alclad is possible. Also, resistance welded joints are higher in joint strength efficiency since resistance welding does not anneal the surrounding area to the extent that is common to fusion welding.

## NEW WELDING PROCESS

**Joints can be positioned horizontally, welds can be made on both sides simultaneously. Arc time is reduced 50%; labor costs down**

AUTOMATIC hidden arc welding has been limited in application to jobs where the joint to be welded is in position for downhand welding. A new process removes this limitation and extends the advantages of automatic hidden arc welding to jobs where the joint is in positions other than that for downhand welding.

This new process consists of new welding methods, procedures and equipment wherein the previous difficulties of directing the electrode and retaining flux and molten metal in a joint not lying flat are overcome. With this process the plate being welded may be positioned anywhere from flat to vertical, the joint being horizontal.

The new process, referred to as "3 o'clock" welding, greatly reduces the cost of welding and expands the possibilities for the application of hidden arc techniques. Because joints can be positioned horizontally, welds from both sides of the joint can be made simultaneously. This reduces actual arc time on a given joint by about 50% and results in lower direct labor costs. Positioning each weld for downhand welding is eliminated, thus reducing handling and set-up time.

In addition to reducing direct labor costs, savings are made because of the smaller sizes of electrode wire used.

For example, where on a downhand application a 7/32" diameter electrode would be used, in a "3 o'clock" position a 3/32" or 1/8" diameter electrode is used.

This means: lower currents are used; less electrode is required; smaller quantities of flux are consumed; welds of reduced cross sectional area are made, thus wasting less metal in unnecessary build-up.

Welds can be made in either straight seams or following an irregular contour. Other advantages of the new process are a minimizing of the effects of distortion and the causes of weld cracking. Tendency for burn through is reduced and back-up strips can be eliminated where two arcs on opposite sides of the work are used.

The process was developed and patented by Lincoln Electric Co., Cleveland, Ohio. It is ideal for applications such as fabricating pipe, box sections, special I-beams and H-sections, joining clips to automobile bumpers, field erection of large outdoor storage tanks, farm machinery parts and other machine frames.

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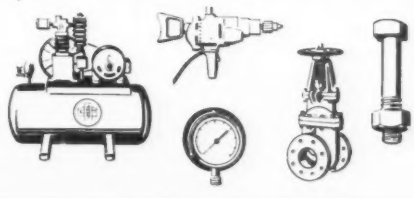

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# EXHIBITORS' LIST

## Western Metal Exposition, Oakland, March 19-23

(Exhibits and personnel included as far as available at press time)

Air Reduction Pacific Co.

Ajax Electric Company, Inc., Philadelphia
Electric salt bath furnace installations, batch and mechanized units. *L. B. Rousseau*, assistant vice-president; *Fred W. Schlapp*, sales engineer.

Aktiebolaget Kanthal (see C. O. Jelliff Mfg. Co.)

Allen Manufacturing Co., Hartford, Conn.
Set screws, cap screws, pipe plugs, shoulder screws, dowel pins, etc. *W. D. Horner*, sales manager; *Paul Pick* and *David T. Lane*, district representatives.

American Pullmax Co., Inc., Chicago.
Shearing machines, showing methods for straight cutting, circle cutting, bonding, joggling, etc. *E. G. Kihlstrom*, sales manager; Wm. Grasmick, service manager

American Optical Co.

Andreassen & Co.

Austenal Laboratories, Inc., New York
Microcastings for industry. *Robert L. Wiseman*, sales manager; *Joseph M. Uhle*, sales representative.

Automatic Temperature Control

Baldwin-Lima-Hamilton Corp.

Bausch & Lomb Optical Co.

EXHIBITORS at the Western Metal Congress and Exposition at Oakland March 19-23 have entered into the spirit of the affair by accentuating the theme "Production for America."

Their displays will show how to increase production, which under present conditions is perhaps even more important than how to reduce cost. In cases where deliveries are delayed because of military demands or inability to get materials or manpower, the exhibits will show how to make existing equipment last longer.

Beets Co., Henry N.

Black & Decker Mfg. Co., Cleveland
Portable electric tools. *A. S. Boehm*, branch manager; *P. A. Pounds, M. E. Lynch, K. E. Gurley, H. E. Bankhead, B. P. Smith*, sales engineers.

Blakeslee & Co., G. S.

Bloom Engineering Co.

Braeburn Steel Corporation, Braeburn, Pa.
Shear blades, slitting cutters, tool bits and aluminum extrusion dies. *John G. Parker*, Los Angeles district manager; *Rex Clayton*, sales engineer.

Braun-Knecht-Heimann
(See Livingstone Engineering)

Bruning Co., Inc., Charles

Buehler, Ltd., Chicago
Specimen preparation equipment for the metallurgical laboratory. *Erich J. Weidner* and *Frank J. Restivo*, sales engineers.

Bundy Tubing Co., Detroit
Copper brazed tubing, straight length tubing and fabricated parts. *W. W. Anderson, Jr.*, assistant general manager; *P. A. O'Connell*, sales manager; *A. F. Bernthal*, sales promotion manager.

California State Polytechnic College, San Luis Obispo
Industrial education for welding technicians at a college level. *R. C. Wiley*, head of welding department; *R. J. Conkling*,


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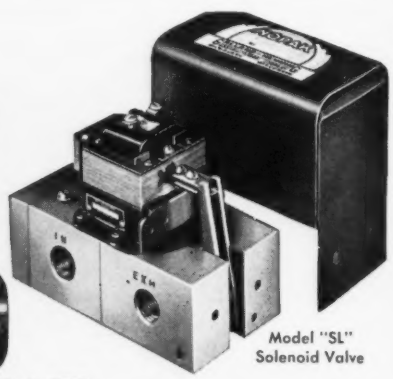
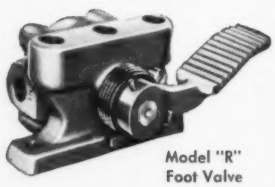
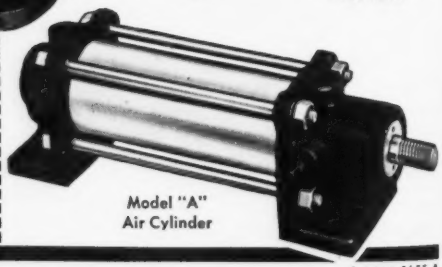

Model "SL" Solenoid Valve

Series 1500 Hydraulic Cylinder


Model "R" Foot Valve


Model "A" Air Cylinder

A 5871-½H-A

*C. J. Meinhart, E. P. Bongio, A. L. Nilsen, A. E. Knipper, L. E. Lorning, H. Wheeler, R. E. Wetzel, R. N. Faires, D. Fullard-Leo.*

**Central Scientific Co., Santa Clara, Calif.**
Laboratory supplies and equipment. *V. F. Duensing,* chief sales engineer and branch manager; *John Byrne,* representative; *J. R. White,* office manager.

**Clementina Company, San Francisco**
Sandblasting equipment and accessories. *Ed Larkin,* president; *Jack E. Smith,* sales manager; *Al Cleary,* manager, Berkeley division; *A. V. Smith,* manager, monument division; *H. Kaufman,* office manager; *Andy Buchan, Bob Grimm, Dave Neitzel,* salesmen.

**Coffing Hoist Company, Danville, Ill.**
Hand and electric hoists. *Ralph Ratcliff,* district sales manager.

**Columbia Steel Co. (See U. S. Steel)**

**Commander Mfg. Co., Chicago**
Multi-drills, tappers, drill chip breakers. *F. J. O'Laughlin,* sales manager; *R. C. Gordon,* district sales representative.

**Commercial Shearing and Stamping Co., Youngstown, Ohio**
Model of a typical hydraulic circuit. Erected steel tunnel liner arch. Representative steel stampings and forgings. *Ward Beecher,* vice-president and treasurer; *H. S. Thompson,* assistant vice-president, sales promotion; *J. R. Hagan,* sales engineer.

**Coulter Steel & Forge Company, Emeryville, Calif.**
Stressproof steels, graphitic tool steels, Ajax drop forgings, Rathbone precision cold drawn shapes. *James V. Coulter,* president; *Victor Walberg,* vice-president; *Philip R. Freeman,* advertising manager.

**Crane Packing Co., Chicago**
Lapping machines, packings, mechanical steels, controls for precision rolling. *R. G. Roshong,* manager Los Angeles office; *G. E. Montgomery,* sales engineer; *C. W. Nelson,* manager San Francisco office; *J. J. Ures,* and *H. Sargent,* sales engineers; *R. J. Brown,* advertising and sales promotion manager.

**Crucible Steel Co. of America, Pittsburgh. (Also Rem Cru-Titanium, Inc., Bridgeport, Conn.; Trent Tube Company, East Troy, Wisconsin)**
Stainless, alloy and tool steels, stainless tubing, titanium and titanium alloy products. *H. G. Bain,* San Francisco; *P. F. Harris,* Los Angeles; *R. M. Simpson,* Seattle. *E. W. Hopper,* chief chemical engineer, Pittsburgh; *J. T. Leyden,* tool steel engineer, Syracuse; *C. I. Bradford,* director of operations, Rem-Cru Titanium, Inc.; *George Fraser,* Rem-Cru sales.

**O. F. de Castro & Associates, Los Angeles. (Also Porter Precision Products, Cincinnati)**
Automatic dial feeds for punch press; automatic dial feed presses; index feeds for presses; piercing punches and dies. *O. F. de Castro,* general manager; *Mrs. O. F. de Castro,* secretary-treasurer; *R. M. Werner,* sales manager; *Walter G. Porter,* president, Precision Products; *Joe C. Fletcher, Burton Fletcher, V. F. Viti,* sales representatives.

**Despatch Oven Company, Minneapolis, Minn.**
Furnaces. *Ray S. Larson,* sales manager; *W. C. Matheson,* resident engineer.

**Detrex Corp., Detroit**
Immersion degreaser. *L. A. Camel,* sales manager; *R. B. Carlisle,* Pacific Region manager; *G. T. Edmonds,* San Francisco division manager.

**Distillation Products Industries**

**Joseph Dixon Crucible Company, Jersey City, N. J.**
Crucibles and refractories; protective coating paints; graphites and lubricants; crayons and pencils. *Donald B. Carpenter, L. L. Greenfield, R. C. Brock,* sales representatives.

**DoAll Company**

**Eclipse Fuel Engineering Co., Rockford, Ill.**
Safety valve for gas shut-off. Press steel pots. Blast and atmospheric burners, accessories. *Everett E. Magnuson,* vice-president; *James H. Sands,* vice-president of sales; *William C. Matheson,* representative.

**Erb & Gray, Los Angeles (Also Silge & Kuhne, San Francisco)**
Laboratory equipment. *Max A. Erb, Milton E. Gray, Martin Silge.*

**Eutectic Welding Alloys Corp.**

**Far-Best Corp., Los Angeles (Also O. L. King & Co., San Francisco, and Allube Corp., Glendale, Calif.)**
Film testing machines. *W. W. Farrar,* vice president, Far-Best Corp.; *Ray Tharp,* president, and *Julian de Sire,* vice-president, O. L. King & Co.; *Sam Hansen,* president, Allube Corp.

**C. E. Freeman Co., Inc., Berkeley**
Flame spray guns, related equipment and coating process. *C. E. Freeman,* president; *W. D. Bell,* vice-president, sales; *M. S. Fein,* technical engineer; *H. W. Croskey* and *Donald Mayers,* sales.

*Continued on page 84*

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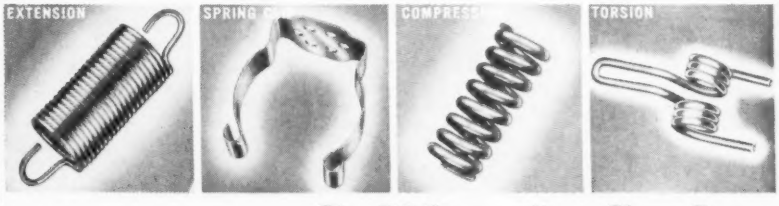


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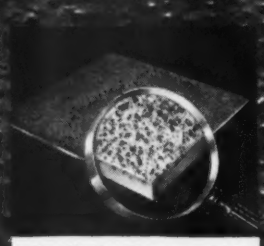

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## EXHIBITORS' LIST . . .

. . . Continued from page 83

**General Electric X-Ray Corp., Milwaukee, Wis.**
Difraction x-ray unit. *A. M. West, C. H. Wantz, R. F. Holste, J. Ranftl, L. M. Rasmussen, F. G. Davis, E. W. Milburn, G. W. Hitchcock, A. H. Jordan.*

**General Metals Corp., Oakland**
*M. W. Hulse,* sales manager; *John Nazro,* sales engineer; *Roy G. Hoog, Edw. Dickman, Chas. Foster,* sales.

**Goldsmith Bros. Smelting & Refining Co., Oakland, Calif.**
Silver brazing alloys, fluxes and related products. *Milton R. Pickus,* vice-president; *Elizabeth W. Henderson.*

**B. F. Goodrich Co., Akron, Ohio**
One-piece blind rivet with internal threads. *R. S. Colley,* sales manager; *M. W. Martin,* manager sales promotion; *W. B. Thayer,* sales engineer (Airsupply Company, Los Angeles).

**Handy & Harman, New York**
Silver brazing alloys, silver-brazed metal parts. *H. A. Folgner, John B. Ross, R. J. Lafferty, Roger Metzler.*

**Haynes Stellite Div. UCC**

**Heli-Coil Corporation, Long Island City, New York**
Screw thread inserts and tools. *E. M. Baruch,* vice-president; *H. Haas,* director of field engineering; *H. E. Linney* (H. E. Linney Co., Oakland, representative).

**Hevi Duty Electric Co.**

**E. F. Houghton & Co., San Francisco.**
Heat treating and metal working products, lubricants, industrial leathers. *W. A. Fletcher,* sales manager Western division; *J. A. Salzmann, J. J. McCabe, J. L. Vieira, W. E. Hall, J. Bermingham, C. R. Jackson, Walter R. Groce.*

**Huppert Co., K. H. (See C. O. Jeliff Corp.)**

**Illinois Testing Laboratories, Inc.**

**Invincible Vacuum Mfg. Co.**

**Jarrell Ash Co. (See Natl. Spectrographic Labs.)**

**The C. O. Jelliff Mfg. Corp., Southport, Conn. (Also K. H. Huppert Company, Chicago; Perlmuth Colman Associates, Los Angeles)**
High temperature electrical resistance alloys. *Gosta Rehnquist,* vice-president of A/B Kanthal, Sweden. *Erik Hagglund.*

**Jensen Instrument Co.**

**Kalamazoo Tank & Silo Co.**

**Kelite Products, Inc., Los Angeles**
Metal processing and cleaning compounds. *Tom Rawlings,* sales promotion manager; *Carl Von Sonnenburg,* sales manager, Northern California; *Wm. Sorenson,* manager, Southern California.

**Kling Bros. Engineering Works**

**James H. Knapp Co., Los Angeles**
Photographs and catalogs of industrial furnaces, atmosphere generators, hardness testers. *James H. Knapp,* president.

**Kwikset Locks, Inc., Anaheim, Calif.**
Powdered metal parts. *William Tell Thomas,* public relations; *Paul Jaffe,* sales representative; *Irving J. Donahue,* superintendent, powdered metallurgy.

**Leeds & Northrup Co., Philadelphia**
Package furnace controls, pH assembly, load cell, thermocouples, thermohms, rayotubes. *A. E. Tarr,* manager, industrial division sales; *J. W. Robinson,* Western regional manager; *P. H. Ditzler, I. F. Omwake, J. R. Gowen, N. F. Humeny, W. H. James, P. E. Page, Jr., R. D. Failor, M. D. Liechty,* sales engineers.

**Le Fiell Mfg. Co.**

**Leitz, Inc., E.**

**Lincoln Electric Co.**

**Linde Air Products Co.**

**Livingstone Engineering Co., Worcester, Mass. (Also Thermal Engineering & Equipment Co., Los Angeles; Hannam and Associates, San Francisco)**
Steam equipment for spraying paint. *Bradley C. Livingstone*, vice-president, Livingstone Eng.; *Robert W. Hannam, W. A. Styles, R. D. Adams*, R. W. Hannam & Associates; *G. L. Ray, J. W. Shortall, A. R. Thompson, Otto Petersen, H. F. Preston*, Braun-Knecht-Heimann Company, San Francisco; *Chester C. Smith*, Thermal Engineering, Los Angeles; *Horace A. Green*, Missoula, Mont.; *Glenn O. Carson*, H-C Apparatus Eng. Corp., Seattle; *R. W. Higgins*, John Baizley Company, Inc., Philadelphia.

**H. C. Macaulay Foundry Company, Berkeley, Calif.**
Gray iron castings. *Earl Paltenghi*, general manager; *George McDonald*, sales manager; *Roy Kalin*, foundry superintendent; *Howard C. Lauffer, Robert Sainsot*, sales.

**Magniflux Corporation, Los Angeles**
Non-destructive testing equipment. *C. E. Betz*, executive vice-president, Chicago; *W. E. Thomas*, vice-president in charge of sales, Chicago; *Lloyd J. Oye*, West Coast manager; *Robert G. Strother, R. P. Turner*, field engineers.

**P. R. Mallory & Co., Inc., Los Angeles**
Resistance welding and special metals. *Charl M. Gutheil*, manager; *Elmer Hodges, George H. Denny, Bernard A. Arvin.*

**Matheson Co., Wm. C. (See Despatch Oven Co. and Eclipse Fuel)**

**Merrill Brothers**

**Michigan Tool Co., Detroit**
Cutting tools, high speed and carbon.

**A. E. Milne & Co., San Francisco**
Solid and hollow high speed tools, tool and die steels, pre-formed, cold drawn steel shapes. *Henry Sears Hoyt*, senior partner; *J. King Hoyt*, partner-in-charge, Pacific Coast; *Robert D. Cortelyou*, Pacific Coast manager; *James K. Hoyt*, sales engineer, Pittsburgh. Also following members of Pacific Coast firms distributing Milne steels: *Warren J. Ulrich*, president, and *R. E. Long*, assistant manager, Pacific Machinery and Tool Co., Portland; *C. M. Beebe*, manager, and *E. J. Hovey*, sales manager, Tayler-Spotswood of California.

**Minneapolis-Honeywell Regulator Co., Philadelphia**
Processing control specialties. *R. R. West*, industry manager; *W. L. Gustafson*, industrial manager; *J. Paull, J. McLaughlin, R. S. Corbin, W. J. Kirby*, sales engineers; *R. B. Grant, W. A. Clements, W. S. Blackman, R. Brogie, W. E. Dixon, E. S. Ferree, L. Aplin, A. T. Challman, T. W. Tracy.*

**Mir-O-Col Alloy Co., Inc.**

**Modernair Corporation, San Leandro, Calif.**
Air and hydraulic production equipment. *John E. Goldring*, president; *James A. Harding*, production manager; *Melvin P. Lewis*, chief engineer; *Warren Wilcox*, research and development; *Lorin Conarton* and *Lloyd Cowdin*, sales; *Clark E. Rucker* and *Herb Vickery*, distributors.

**Montague-Harris & Co., San Francisco and Los Angeles**
Press brakes, saws, flux recovery units, bending equipment, shears, punches, punch presses, and other metal working machinery. *Arthur Harris*, co-owner in charge of sales; *John Montague*, Northern California manager; *Don R. Baker*, advertising manager; *Bill Forbes, Ed Voth, A. J. Levine, George Burns, Dave Burke, Herb Johnson*, sales representatives.

**National Diamond Hone & Wheel Co.**

**National Diamond Laboratory, New York**
Industrial diamond equipment. *Harry L. Strauss*, owner; *Harry L. Strauss, Jr.*, general manager; *John Brown, Jr.*, treasurer; *E. Lowe*, secretary; *J. Magnus, H. Devaney*, sales.

**Natural Gas Equipment Co.**

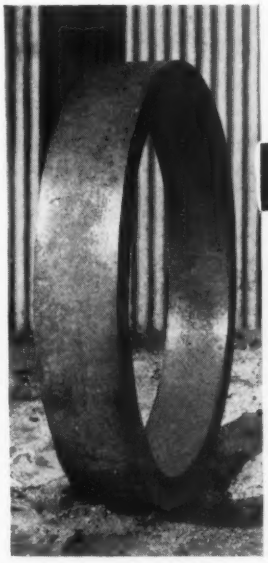
**National Machine Tool Co.**

**National Spectrographic Labs., Inc., Boston. (Also Jarrell Ash Company, Cleveland; Opplem Company)**
Spectrographs and related equipment. *H. M. Bedell*, president; *D. R. Moore*, vice-president (National Spect.) *R. E. Ashley*, vice-president; *F. R. Breck*, director of research, (Jarrell Ash).

**Nelson Stud Welding Div., Lorain, Ohio**
Stud welding equipment. *Verne Bender*, manager of distributors' sales; *A. E. Bosley*, field engineer, San Francisco region; *George E. Kennedy*, field engineer, Los Angeles region.

**North American Philips Co., Inc., Mount Vernon, N. Y.**
X-ray diffraction units, and other elec-

*Continued on page 86*

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**Los Angeles 58, California**
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## EXHIBITORS' LIST . . .

. . . Continued from page 85

tronic equipment. *M. J. Dorenbosch*, general manager; *C. J. Woods*, sales manager; *J. S. Buhler*, technical-commercial manager.

Norton Company

Oakite Products, Inc.

Oakland Chamber of Commerce

Olsen Testing Machine Co., Tinius

O'Neil & Irwin

Opplem Co. (See Natl. Spectrographic Labs.)

Osborn Manufacturing Company, Cleveland
Brushes and samples of work accomplished with them. *P. A. Malling, J. R. Broughan*, West Coast representatives.

Pacific Brass Foundry, San Francisco (Also Frontier Bronze Corp., Niagara Falls, N. Y.)
Typical non-ferrous castings, including various special alloys. *F. M. Mainzer*, vice-president; *Jack Mainzer*, production manager; *Robt. Mainzer*, secretary-treasurer; *Clifford McKelvey*, sales manager; *Don Caudron*, metallurgist; *J. O. Craven*, sales, Frontier Bronze Corp.

Pacific Factory (Magazine) San Francisco

Pacific Gear & Tool Works (See Western Gear Works)

Pacific Industrial Mfg. Co.

Pacific Machinery and Tool Steel Co.

Pacific Oxygen Co.

Pacific Scientific Co., San Francisco (Also Partlow Corporation)
Testing machines, measuring devices, industrial and laboratory furnaces, indicators, controlling devices. *V. E. Lysaght-Wilson*, vice-president; *D. H. Grubb*, secretary-treasurer; *W. J. Parsons*, manager industrial division; *H. E. Mescher, A. E. Cozens, R. W. Weld, R. S. Eustis, W. G. Powers*, sales engineers. *Howard Partlow*, Partlow Corp.

Pacific Steel Castings Co.

Partlow Corporation (See Pacific Scientific Co.)

Paulson Johnson Co.

Perlmuth-Colman & Associates (See C. O. Jelliff Mfg. Corp.)

Physicists Research Company, Ann Arbor, Mich.
Equipment for shop measurement of surface roughness, tracers, reading recorders. *Frank W. Kabat*, head of field representatives department.

Porter Precision Products (See O. F. de Castro Associates)

Precision Metalsmiths, Inc., Cleveland
Precision investment castings. *R. A. J. Wellington, R. C. Kleindinst, C. H Watts.*

Reeves Pulley Co., Columbus, Indiana
Speed reducers, speed gears.

Rem-Cru Titanium, Inc. (See Crucible Steel)

Richardson X-Ray Service (See X-Ray Supply Co.)

Joseph T. Ryerson & Son, Inc., Chicago
Carbon, alloy and stainless steel. *W. D. Dukette*, manager Oakland plant; *John W. Queen*, manager alloy steel division; *H. A. Archer*, manager alloy and stainless sales; *Allen P. Beckloff*, manager tubular products division; *T. W. Staley*, manager tubing sales; *Dr. V. O. Homerberg*, metallurgical consultant, all of Oakland plant; *T. L. Kishbaugh*, manager Los Angeles plant; *C. H. Hallett*, sales manager, and *C. D. D'Amico*, manager of stainless sales; *H. J. Bedell*, manager alloy sales, all of Los Angeles plant; *J. P. Conroy, S. F. Lane, W. H. Miller, R. E. Pearson, E. Salonen, F. Shudoma, S. W. Shutt, R. W. Faber, F. B. Makens, L. W. Werthman, R. L. Ray, L. Habben*, sales representatives, Oakland.

Silge & Kuhne, San Francisco (See Erb & Gray)

Service Machine Co.

Simonds Saw and Steel Co., Fitchburg, Mass.
Complete metal cutting line. *Walter Nussbaumer, Carl C. Strout, John W. Luders, Sr.*, sales engineers.

South Western Gear Works, Houston, Tex. (See Western Gear Works)

Sperry Products, Inc., Danbury, Conn.
Ultrasonic instruments for detection of flaws and measuring thickness; hydraulic remote controls; self-sealing couplings. *G. D. Smith*, Pacific Coast representative.

J. W. Stacey, Inc., San Francisco
Engineering publications. *Hans Raus.*

Surface Combustion

Tayler-Spotswood of Cal.

Tempil Corporation, New York
Temperature-indicating crayons, pellets and paint. *David R. Kasanof*, president; *Arthur B. Tesmen*, sales engineer.

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Clipper
BELT LACING EQUIPMENT
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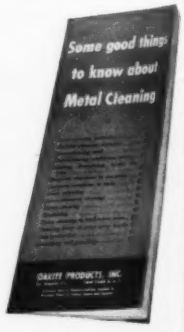


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Check this list of jobs discussed in Oakite's 44-page booklet on Metal Cleaning; then write to Oakite Products, Inc., 1001 E. First St., Los Angeles or 681 Market St., San Francisco, Calif.

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*Tell me (without obligation on my part) about Oakite methods and materials for the following jobs:*

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- American Chemical Society
- American Foundrymen's Society
- American Institute of Chemical Engineers
- American Institute of Electrical Engineers
- American Institute of Mining and Metallurgical Engineers
- American Society of Civil Engineers
- American Society of Mechanical Engineers
- American Society for Metals
- American Society for Testing Materials
- American Society of Tool Engineers
- American Welding Society
- Institute of Aeronautical Sciences
- Mining Association of California
- National Association of Corrosion Engineers
- National Association of Lubrication Engineers
- Pacific Coast Gas Association
- Purchasing Association of Northern California, Inc.
- Society of Automotive Engineers
- Society for Non-Destructive Testing

**Tinnerman Products, Inc., Cleveland, Ohio**
Speed nuts, speed clips, engineered fasteners. *Wm. M. Buttriss,* director of advertising and sales promotion; *H. H. Harman,* Pacific Coast field representative; *E. J. Cloutier,* Pacific Coast district manager; *H. H. Hayden,* sales consultant.

**Trent Tube Co. (See Crucible Steel)**

**Union Carbide & Carbon Corp. (See Haynes Stellite)**

**United States Steel Corp. (Also Columbia Steel Co., U. S. Steel Export Co., U. S. Steel Supply Co.)**
Steel, stainless steel, wire rope. *R. G. Hill,* manager of advertising, Columbia Steel Co.

**Unitex Corp., Pasadena, Calif.**
Industrial spotwelders. *Frank Johnson,* vice-president; *Chet Stinson,* sales manager; *Leigh Call,* sales representative.

**Van Dorn Electric Tool Co., Cleveland**
Portable electric tools.

**Victor Equipment Co., San Francisco**
Welding and cutting apparatus, gas medical therapy equipment, gas discharging manifolds, hard facing and blasting nozzles, pneumatic controls. *L. W. Stettner,* president and general manager; *E. A. Daniels,* vice-president in charge of sales; *Byron E. Helms,* advertising manager.

**Vlier Mfg. Co., Los Angeles**
Torque thumb screws, spring plungers, fixture keys. *Blaine H. Vlier, Sr.,* president; *George B. Vlier,* sales manager; *John G. MacPherson,* prop., Western Tool & Supply Co.

**Waldron Corp., John—Flexible Coupling Division**

**Walker-Turner Co.**

**Wells Manufacturing Corporation, Three Rivers, Mich.**
Metal cutting band saw machines and

Continued on page 88

READY TO SERVE YOU...

A GREAT **NEW**

APPLETON REELITE!

Here's the new, *all new,* Appleton 7S Portable Reelite—a compact, automatic cord take-up reel that solves the countless lighting problems of car-loading, machine inspection, maintenance work—any job that requires good illumination in out-of-the-way places.

Double silver alloy collector brushes—one of many outstanding new features—permit continuous rotation of the entire reel in either direction without power interruption or tangling of the cord. This versatile device furnishes light—or a flexible power source for power tools—when and where you want it. Positive stop action holds cord at desired length; then cord is automatically re-reeled when job is done.

The Appleton 7S Portable Reelite is completely encased in steel, finished in baked hammertone enamel. It is easily installed on any 4" octagonal outlet box. Available accessories include six types of handlamp, machine tool connector body or key socket. A vaporproof model is furnished complete with handlamp. Write for full details on this and other Portable Reelites.

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CONDUIT FITTINGS • LIGHTING EQUIPMENT • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

## EXHIBITORS' LIST . . .

. . . Continued from page 87

automatic stock projection equipment. *R. W. Bowers*, vice-president and general manager; *E. H. Van Loo, Jr.*, service engineer; *R. N. Stephenson*, sales engineer.

Western Gear Works, Los Angeles and Seattle
Gears, speed reducers, gear motors, aircraft transmissions, actuators, marine gear units. *C. F. Bannan*, vice-president; *William Hoard*, sales manager; *G. W. Malme*, advertising manager.

Western Industry (Magazine) San Francisco
*A. C. Prendergast*, editor; *James E. Howard*, managing editor; *Earl F. Hubbard*, circulation manager; *Franklin B. Lyons*, sales manager; *Victor C. Dowdle, Jerome E. Badgley*, district managers.

Western Machinery & Steel World (Magazine)

Western Metals (Magazine) Los Angeles
Data on growth and characteristics of the western metal working industry. *Robert C. Johnson*, editor-manager; *Louis C. Kendall*, field editor.

Western Tool & Supply Co.

Westinghouse Electric Corp., San Francisco
Welding equipment. *E. W. Bartz*, welding engineer; *Harold Aul*, San Francisco x-ray manager.

Westinghouse Pacific Coast Brake Co., San Francisco
Compressors, pneumatic control devices, power tools and other industrial products. *J. B. Hull*, vice-president; *J. A. Campbell*, district engineer; *B. E. Marler*, sales engineer; *J. R. Edmund*, plant engineer; *C. G. Coker, W. H. Winheim, J. F. Graham*, representatives.

Wheelco Instrument Co.

Wilson Mechanical Instrument Co.

Wilgus Mfg. Co.

X-Ray Supply Co., Los Angeles (Also Richardson X-Ray Service, Los Angeles; Eureka X-Ray Tube Co., Chicago)
X-ray apparatus. *R. A. Richardson, R. A. Richardson, Jr., R. G. Cron*, technical salesmen.


**NEW Norgren MICRO-FOG Lubricator**

***Revolutionary Progress in Air Line Lubrication***

This new Micro-Fog Lubricator by "The Pioneer in Oil Fog Lubrication" breaks each drop of oil down into extremely fine uniform size particles (dia. 2 microns—.00007874"—or less) that REMAIN IN SUSPENSION for an indefinite period of time.

- **Micro-Fog** travels far greater distances. Location of lubricator in relation to units served is no longer a critical factor.
- **Micro-Fog** can be uniformly distributed to several outlets—serving multiple units operating simultaneously.
- **Possibility** of flooding lines or equipment is reduced to the very minimum.
- **Air flow requirement** is greatly reduced. Constant, uniform delivery of oil fog is precision-controlled—down to as little as one drop in 20 minutes delivered into the air stream, if required.
- **Accomplishes** more thorough lubrication. Completely automatic. Fully-visible oil feed and supply.
- **Product of years** of research and development, plus over 20 years know-how in air line lubrication. Fully field-tested and approved in many industries.

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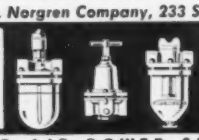


Lubricators, Regulators, Filters, Relief Valves, Check Valves, Air Governors, Needle Valves, Hose Assemblies and Couplings.

25 YEARS OF HELPING AIR POWER SERVE INDUSTRY BETTER

**WALTER E. JOMINY, President, American Society for Metals. Mr. Jominy, who is staff engineer for Chrysler Corporation, Detroit, will discuss "Reducing Wear by Proper Metallurgy" at the Western Metal Congress.**

**WILLIAM H. EISENMAN, Secretary, American Society for Metals. "Bill" Eisenman is the dynamo who makes the biennial Western Metal Congress and Exposition a big success. Two years hence he will stage one at Los Angeles.**

## "Industrial Supermarket" Fills a Great Western Need

"WE CAN FILL a customer's order in half the time it used to take," says Republic Supply Company of California, "since we applied super-market ideas to our plant. And that includes thousands of items (nearly 30,000, in fact)—tools, equipment, and piping materials that are constantly being required by industries in the West."

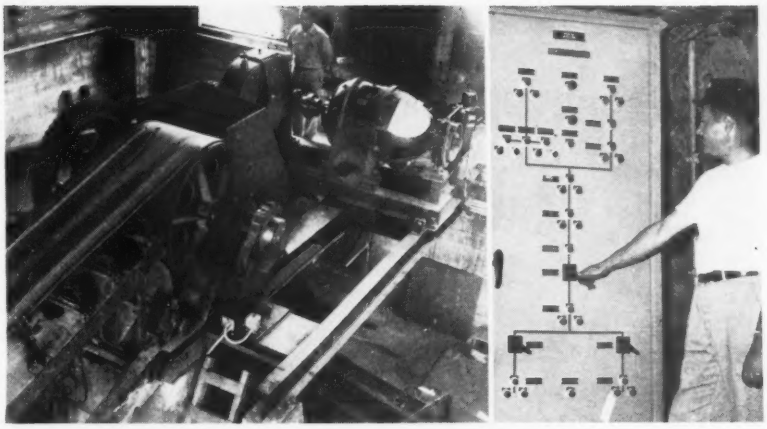
The main difference between the grocery super-market and this industrial brother is that the customer does not wheel around a little cart, like the housewife. A clerk does it for him.

When a firm phones in an order, the stock clerk wheels a shopping cart around for the various items and brings his selections to the checking counter where it is packed, billed, and made ready for delivery.

That shopping cart is an ingeniously fitted platform truck with adjustable bins and shelves which can hold a ton of miscellaneous items, from nipples and nuts to sizable valves. The upper part has movable partitions which can be fitted into slots so that the operator can set up a dozen bins of various sizes for the different items he finds in the order.

Heavy pieces are stored on shelves below. The operator circulates with the truck, super-market style, gets everything together and brings it to the packing counter. From there it is either picked up by the customer or is delivered to him.

The new main headquarters of Republic Supply Company of California in Los Angeles were designed for efficient operation by industrial architect, George Vernon Russell, after months of preliminary study of the company's procedures and inter-departmental activities. See *Western Industry*, Nov. 1949, pp. 38-41.



**Better than 350 tons of material each hour are transmitted along this mile-long underground conveyor system, controlled by only one man, from any of four loading stations.**

## One Man Controls One-Mile Conveyor

DUAL CONTROLS for airplanes or for practice automobiles are fairly simple and common. But quadruplex controls by which the different operations of a mile-long underground conveyor belt are controlled from any of four widely separated points without risk of error—that's something else again. This problem, as it arose at the Pend Oreille Mines and Metals Company Lead-Zinc property in northeastern Washington, illustrates the unique situation presented to motor and control engineers of Westinghouse Electric Corporation.

In this mine the conveyor-belt system, when completed, will haul ore and waste alternately from four loading stations at intervals along a vein extending into the earth at slopes vary-

Another Load GOES UP
Another Equipment Builder
STANDARDIZES ON
WISCONSIN ENGINES

Hauling as much as 2500 lb. loads STRAIGHT UP at 178 f.p.m. takes dependable power. And the hoist of this Portable Builders' Tower, built by Clyde Iron Works, and powered by a Wisconsin Heavy-Duty Air-Cooled Engine, delivers it.

Builders and buyers of equipment naturally STANDARDIZE on Wisconsin Engines, especially where you need a steady pull on a long haul. For example, tapered roller bearings at both ends of the crankshaft eliminate radial and end thrusts. And, you have no cooling troubles, because of fool-proof air-cooling at its best in any weather.

An OUTSIDE magneto with impulse coupling delivers sure-fire starting at slower cranking speed. Heavy-duty construction throughout assures you of heavy-duty service year in and year out . . . and more profit in every contract.

4-cycle single-cylinder, 2-cylinder, and V-type 4-cylinder models, 3 to 30 hp. Write for information.

WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
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Stuart Oxygen Co.
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This is a fast-moving efficient organization of competent people, always ready and able to serve you well.

ing from 10 to 18 degrees. Principal control problems arise out of the requirement that (1) the whole system of loading the belt with either ore or waste, (2) operation of the conveyor motors to the surface, and (3) the proper discharge equipment at the surface be controlled by a single operator from any of four loading stations. Obviously it is imperative that there be no risk of mixing ore and waste material, also that the system be interlocked to prevent piling up of material at any point.

A system of controls of the conveyor motors, with complete interlocking, was developed and tried on a miniature simulated system. Indicative of the complexity is the 47-conductor control cable required to run the length of the system. When the initial service test was made the rated capacity of 350 tons of material per hour was well exceeded without a hitch.

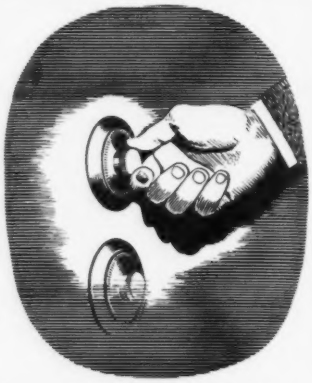
### Three $500 Scholarships

Three scholarships of $500 each to senior high school students who will be attending a four-year college or university during the coming academic year will be awarded by the California State Federation of Labor. Awards will be based on the candidates' score in a special examination and his four-year high school academic record.

---

**WELDING "Y"-BRANCH fittings of a huge sulfur and heat recovery system for blow-pit gases at Soundview Pulp Company, Everett, Wash. Armco stainless steel type 316 ELC (extra low carbon) solves the problem of corrosion adjacent to the welds. This corrosion, due to carbide precipitation, is generally avoided by heat treatment when parts can be placed in a furnace. Because these fittings were so large, heat treating after welding was practically impossible. Therefore, an alloy that does not require heat treatment was used. The large butterfly valves are fabricated from plates of this special-purpose stainless steel.**

The *RIGHT* COMBINATION



for the *RIGHT* Employee-Insurance Program . . .

1 Competent Advice from Your Local Insurance Agent or Broker . . .

2 Cal-Western's "TAILOR-MADE" Group Insurance Plans . . .

California-Western States LIFE INSURANCE COMPANY

HOME OFFICE: SACRAMENTO

GROUP INSURANCE SALES OFFICES IN PRINCIPAL WESTERN CITIES

## Dollars From Waste

AN IMPROVEMENT project which turns two refinery waste products into a chemical fertilizer has been completed at a cost of over $250,000 at the General Petroleum Corporation's Torrance (Calif.) refinery.

This project, involving a new process, produces eleven tons daily of ammonium sulfate, a nitrogen-bearing chemical used by California farmers for soil fertilization.

It starts with waste refinery gases which are bubbled through sulfuric acid, producing a solution of ammonium sulfate. This liquid is piped to another vessel which turns it into crystal form by partial evaporation of the brine.

Resulting ammonium sulfate crystals are then separated by a centrifuge and are blown into a hopper from which trucks can be loaded by gravity. The crystals contain over 20.9 per cent nitrogen.

A unique feature of the process is the fact that instead of using pure sulfuric acid—a critical defense material currently in short supply—the unit uses acid sludge, another refinery waste which presents refineries with a tough and expensive disposal job.

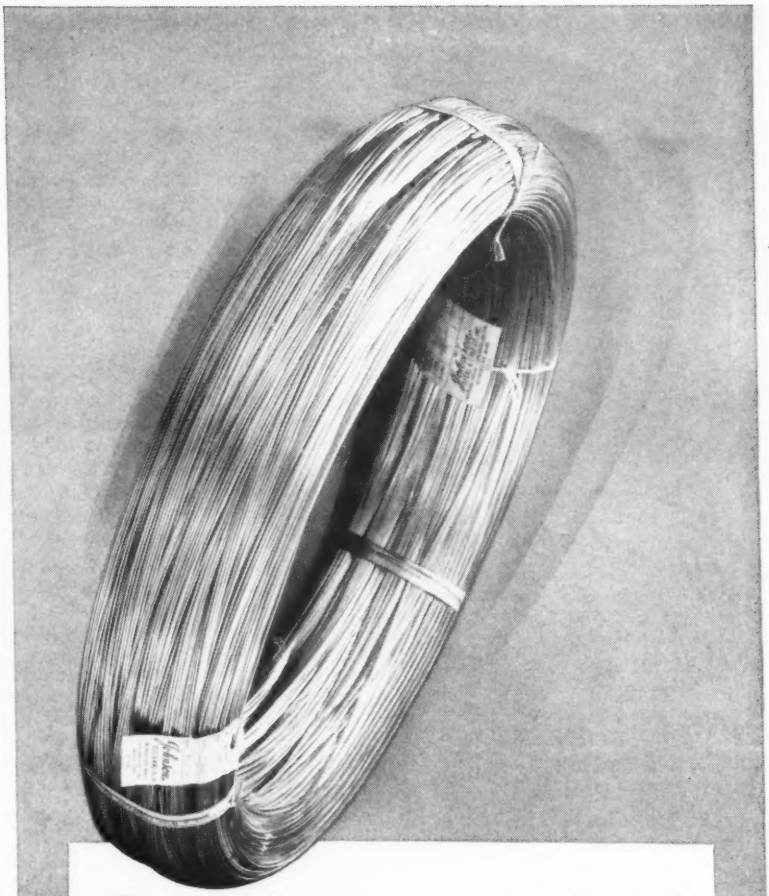
The entire output of the new unit has been contracted for by the California Farm Bureau Federation, a cooperative buying organization of California farmers.

The new unit was engineered and constructed by The Fluor Corporation, Ltd., Los Angeles.

## Calcium Carbonates in Rubber Compounds

DIFFERENT calcium carbonates when used at the same loadings will give almost as varied results in natural rubber as will different carbon blacks, according to Victor H. Vodra, manager of the calcium carbonate department of Wyandotte Chemicals Department. Loading curves for various particle sizes of calcium carbonates show that the physical properties in natural rubber, such as tensile strength, flex life and tear resistance fall off less rapidly as the particle size decreases.

When the particle size becomes less than 0.1 micron, there is an increase in these physical properties and definite reinforcement can be proved, particularly when the particles are the size of EOC and HAF blacks. Because of low stiffening, these ultra fine carbonates are ideal for extending crude rubbers, improving quality and decreasing costs. However, they do not improve abrasion resistance.

*For specialty wires—a specialty mill*

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HARD DRAWN SPRING WIRE.
HIGH CARBON ROPE WIRE.
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## SAND ENGINEERING . . .

. . . Continued from page 77

ating people, particularly with regard to the control of sand mix production.

Exacting control over such variables as milling time, water hardness, etc., is necessary in the production of engineered sands. This includes variables in operation formerly held as insignificant. It can be seen that coordination and education are essential factors in the successful application of sand engineering.

### Three Phases

Quality of steel castings is improved while production costs are lowered when Sand Engineering is fully realized in the foundry. The concept is composed of three important phases which must all be present in an adequate program. These phases are:

1. A determination of the fundamental physical and chemical requirements for each sand mold in the foundry.
2. Formulation of engineered mixes to meet these requirements.
3. Coordination and education necessary in producing engineered sands on a commercial scale.

### Transition—Art to Engineering

Sand Engineering programs have been initiated in many foundries throughout the country. If an historical line of demarcation is possible it might be said that the coming year with its heavy demand on the foundry industry will witness the transition from sand art to sand engineering.

## CORROSION . . .

. . . Continued from page 52

utilization of the closest electrically similar metals where a group of dissimilar metals is necessitated, and his choice of a finish which will guard them against a corrosive battery, is the first stage of protection.

A group of finish specialists also is on call to all Boeing engineers for consultation where any doubt exists. These men go over completed drawings as a double check.

### Secret Weapon

Boeing's second anticorrosion weapon is education; education aimed at its own employees and at firms who supply it with parts. More than 1,000 Boeing engineers, meeting in small groups have listened to hour-long lectures on corrosion, its effects, and how to prevent it. Suppliers of parts who have inadvertently sent Boeing improperly finished assemblies of dissimilar metals have received lectures also, in one form or another.

**SPIRATUBE**

You can help speed up production by giving him air when and where needed.

Retractable, durable, efficient, light-weight, non-collapsible Spiratube follows him around corners, down shafts, above and below decks, into out-of-the-way places . . . BLOWING OR EXHAUSTING. Designed for maximum air passage. Sections couple tight, fast, for permanent or portable service. Spiratube fits into present systems. Standard sizes for all requirements immediately available from well-stocked distributors — Coast-to-Coast. Used by leading public utilities, shops, mines, shipyards, and industry everywhere.

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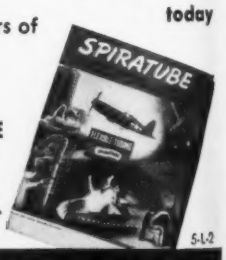


S-1-2

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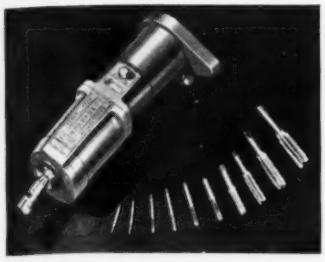
# NEW MATERIALS & EQUIPMENT

***FOR YOUR CONVENIENCE . . .***
***Use postage-paid card following page 100 to obtain further information on products described on these pages and literature listed on following pages . . .***

E-301

## Tapping Machine That Thinks for You

*Features claimed:* Commander Tapper, handling the widest range of any tapping head made (0 to ¾") has adjustable torque control that can be set to protect any tap within its range. Rotary action automatically stops when taps are dull, overloaded, or strike bottom in blind hole tapping. This permits inexperienced workers to do precision work. Spring clutch employed in Commander eliminates slippage, assures quiet, smooth, easy operation.



*Available from:* Commander Mfg. Co.

E-302

## Nylon Plastic Balls for Valves and Bearings

*Features claimed:* An industrial first, they come in sizes from ⅛" to ¾" diameter, and with tolerances to plus or minus .001". They provide toughness at low temperatures, they are abrasion-resistant, they offer stability at high temperatures, and they are light in weight and chemical-resistant. Coefficient of linear thermal expansion is 5.5 x 10.5. There is a low thermal conductivity of only 1.7. Electrical properties offer a short-time dielectric strength of 385, a 60-cycle dielectric constant of 4.1. Water absorption is very low, 1.5. Flamability is self-extinguishing.

*Available from:* Ace Plastic Co.

E-303

## Impact Wrench

*Features claimed:* This new portable electric impact wrench applies and removes screws, studs, and nuts in jig time. Has proved ideal for nut running up to ½" bolt size. Designed for easy one-hand operation for steel construction, all-around industrial jobs, and automotive work, this 11-inch, seven-pound unit is good for use in close quarters. New pistol grip and trigger switch allow better control and instant response. Powered by a reversible, air-cooled motor for operation on 115 volt AC-DC. Model for 230 volts also available. Impact hammer is mounted on an

REALOCK

PROTECTION PLUS

- All fittings, hinges and locking devices have bolts *on the inside,* secure from tampering.
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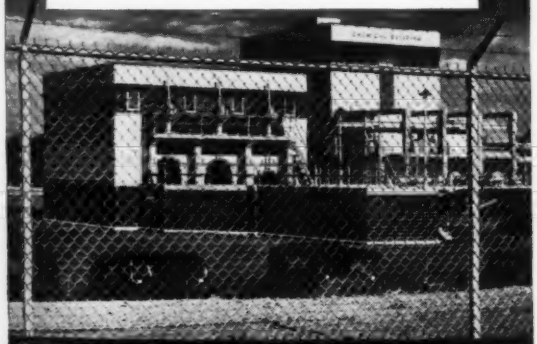
*For complete details refer to Sweet's Catalog. For free estimate consult your classified telephone directory—or write direct.*



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AFTER A TWO-YEAR survey of all leading machine manufacturers, The Yale & Towne Manufacturing Company selected KUX as the line of Die Casting Machines superior to any in the country.

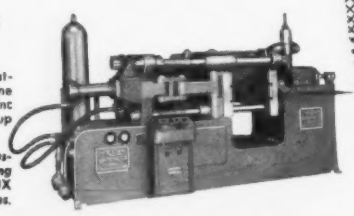
Now, production lines of powerful KUX Die Casting Machines, installed in Yale plants, produce their various hardware castings on a 'round-the-clock basis.

Possibly your product can be redesigned to use die castings with substantial savings in manufacturing costs. Let KUX engineers give you the answer.

MODEL BH-30 ILLUSTRATED

Hydraulically operated die casting machine for production of zinc castings weighing up to 10 pounds.

*Write today for illustrated catalog showing complete line of KUX Die Casting Machines.*



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anti-friction bearing that eliminates kick and twist in your hand. Housing of die-cast aluminum alloy. Model 2EW priced at $120.00.

*Available from:* Mall Tool Co.

E-304

### Chrome Plate Your Own Tools For Longer Life

*Features claimed:* Normal life of most cutting tools and wear parts can be multiplied 3 to 10 times by a new industrial hard chrome plating process embodied in the Chromaster and Chromasol. Chromaster provides production industries with complete facilities for hard chrome plating metal surfaces up to 10 sq. in. at a recommended current density of 2 amps per sq. in. The unit is compact and completely portable. Operating at room temperature, Chromasol is a new, non-critical chrome plating solution shipped to user in a liquid, concentrated form. It delivers a hard chrome plate that follows exact characteristics of base metal to which it is applied.

*Manufacturer:* Ward Leonard Electric Co.

E-305

### Drill for Heat Treated Steel

*Features claimed:* Super-Hard Drill, a carbide drill for putting holes into heat treated steels, is stocked in 1/8" to 5/16" diameters, with unlisted sizes available on request. Diameters 3/8" to 3/4" are carried in stock by the makers in carbide tipped hexagon shank, with brazed tip. Drills

10 TIMES HIGHER ABRASION RESISTANCE... standard abrasive wheel test

4 TIMES HIGHER SNAG RESISTANCE... standard needle test

MUCH HIGHER CHEMICAL RESISTANCE... standard strip immersion tests . . . than natural rubber or standard synthetics

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THE SURETY RUBBER CO.

Ask for Surety's unique Glove Selector, the quick guide to the right glove material for your operations. Dept. A.

feature a long solid carbide end that tends to keep heat well away from the braze. In extensive tests, the new de-

sign has indicated a marked rise in efficiency and up to 200% greater strength than conventional tipped drills.

*Available from:* Super Tool Co.

E-306

### Automatic Separator for Sheet Steel

*Features claimed:* Difficulty in separating sheets of steel for feeding into stamping presses and press brakes is eliminated by means of this new, moderately priced non-electric, permanent-type magnet unit known as Verson Magnetic Sheet Floater. It speeds up sheet handling and reduces injury to workers. Consists of powerful Alnico magnets, a stainless steel mounting bracket and a stainless steel wearing plate welded into a single, compact unit. It induces a magnetic field in the sheets in such a manner that sheets repel each other, causing their ends to fan out with air space between them. Top sheet can then be easily grasped by the worker and fed into the press.

*Available from:* Verson Allsteel Press Co.

E-307

### Automatic Pulley Clutch

*Features claimed:* Designed for use with gasoline engines on powered lawnmowers, garden tractors, motor scooters, elevators, pumps, motorbikes, etc., the V-Plex clutch is well-adapted to applications requiring high starting torque. Consists of only four main parts, is self-contained as a single rotating unit, quickly installed by simply slipping it over the engine drive shaft and tightening the self-locking set screw. Operates by centrifugal force, automatically tightens the belt as throttle is opened, releases it

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HE'S HEADIN' FOR A HEADACHE

...are you?

Nearly every design engineer has had the same experience—developed a seemingly "perfect" new machine right up to the final blue print stage only to find hidden "bugs" that spell trouble ahead.

Often these "bugs" stem from bearings —their improper or inadequate application, *THAT IS!*

Most engineers, when confronted with anti-friction problems, turn to specialists —engineers who have accumulated years of experience and "know-how" in this one field. Such is the caliber of Aetna's engineering staff. Thanks to them, leading machinery manufacturers often save months of needless time, effort and expense in product development.

If you're heading for a headache which sound anti-frictioneering can forestall, consult Aetna. Whether you require new bearings or precision parts "designed from the ground up", or merely help in selecting standard bearings, Aetna stands ready to solve your problems in the shortest possible time and at the lowest possible cost. Aetna Ball and Roller Bearing Company, 4600 Schubert Avenue, Chicago 39, Illinois.

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when engine is idling, operates equally well in either direction. This variable-pitch pulley clutch engages at a smaller diameter than when driving, so it operates as a combination clutch and automatic transmission.

*Available from:* Light Inspection Car Works.

E-308

### Pipe Cutting Pantograph

*Features claimed:* A semi-automatic guided torch machine that produces perfectly prepared and beveled cuts, either straight, curved, or angular, for almost any intersection required in pipe fabrication work. Horizontal reciprocating movement of the cutting torch is automatically guided and synchronized, by means of a cam or an eccentric, with the rotation of the pipe to be cut so as to produce the contour of cut desired. No layout or templates of any kind are required. All cuts are smoothly finished and beveled, eliminating need for grinding or cleaning. For production runs, all cuts are produced to exact and uniform standards. Machine requires no special foundation, and is easily portable.

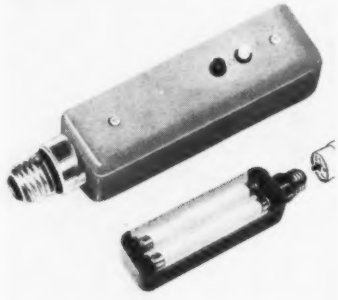
Sample parts cut by pantograph.

*Available from:* Vernon Tool Co., Ltd.

E-309

### Screw-in Attachment for Converting Incandescent to Fluorescent

*Features claimed:* Hot incandescent work lights may now be converted to cool fluorescent simply by screwing a Lite-Mite Bulb into any ordinary lamp socket. The attachment contains two 4-watt fluorescent lamps and all control components entirely within the 2 x 4-in. shade. Shade rotates 300 deg. to focus as desired.



*Available from:* Stocker & Yale.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E-310

### Magnetic Power Sockets

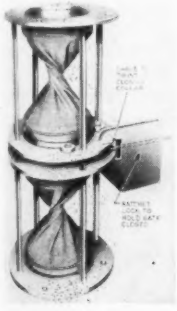
*Features claimed:* A line of magnetic power sockets in ¼", ⅜", and ½" square drive sizes, especially useful for the self-tapping screws now being used in increasing numbers for all types of assembly work. A powerful Alnico magnet is imbedded in each socket and holds flat headed screws firmly. Standard handles and extensions can be used with these sockets. Seven hexagon sizes from ¼" to ½" are available in the ¼" square drive; four sizes from 5/16" to ½" in ⅜" square drive; four sizes from ⅜" to 9/16" in the ½" square drive are ready. All sockets are designed for either power or hand drive, and come in gun-metal finish.

*Available from:* Snap-on Tools Corp.

E-311

### Double-Closure Bin Valve

*Features claimed:* "Twistite" double-closure bin valve consists of two rubber sleeves joined by a rotating steel collar. Dust and drip-tight closure is obtained by pulling on a cable wrapped around the rotating collar, sealing the opening with a twist in each of the rubber sleeves. This valve is self-opening, the elasticity of the rubber sleeves causing them to resume their cylindrical shape immediately when tension on the cable is released. Standard 6-inch valve weighs 35 pounds with the ratchet cable-lock mounted on the frame. It will handle lump sizes up to 2½", requires a 30-pound cable pull for closure. Other valve sizes available on request.



*Available from:* Stephens-Adamson Manufacturing Co.

E-312

### 4-in-1 Four-Ton Punch Press

*Features claimed:* The new 4-in-1 four-ton punch press has numerous exclusive features, including a deep, 12¾-in. throat, a sturdy 400-lb. cast frame and patented clutch


28 Years of Successful use in treating burns!

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Easy spreading antiseptic ointment. Packed in tubes and tins. *In liquid form, too—Kip Antiseptic Oil (with benzocaine).*

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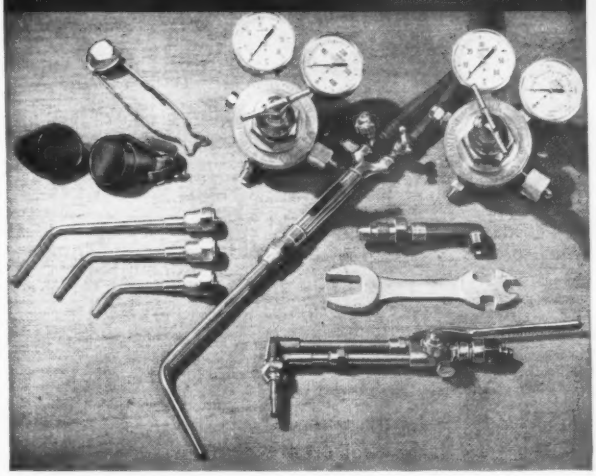

The flexibility and wide range of Unit WC-25, shown here, enable you to do all usual welding and cutting operations, either in production or maintenance work. For special jobs such as hard-facing, multi-flame heating, deseaming, brazing, descaling, you simply add suitable tip, nozzle or attachment.

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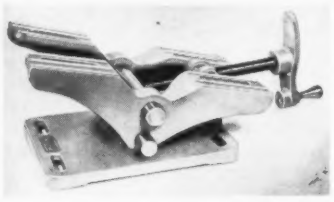
drive dog built into the clutch collar instead of a slot in the crankshaft. This was engineered to eliminate weakening the one-piece shaft by deep milling. A special patented trip mechanism permits the operator to change from single to continuous ramming without stopping the press.

*Manufacturer:* Kenco Manufacturing Co.

E-313

### Tilting Motor Base for Fractional HP Motors

*Features claimed:* A new, light-weight tilting motor base is adjustable in width and length to accommodate all sizes and types of fractional motors up to 1 hp. Used with variable speed drives and for easy belt changing on Cone Step Pulleys, the unit acts as a belt tightener as well. A handle screw adjustment provides exact speed control and changes while the machine is in use. Correct belt tension and alignment is constantly maintained. The tilting base is only 5½ in. by 7 in. and the shipping weight is 10 lb. Price has been set at $6.00.

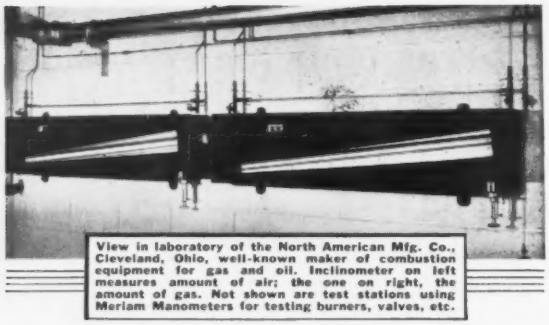


*Manufacturer:* Lovejoy Flexible Coupling Co.

E-314

### Faster, Stronger Wood Screw

*Features claimed:* In this double-threaded screw, the two separate threads start from opposite sides of the shank, spiral the root in parallel formation, and terminate in a single centered point. This twin-thread construction provides twice the thread pitch of the conventional single-thread screw, causing twice as much thread to enter the material at each turn, hence cutting in half the number of turns needed to seat the screw. Has a clyindrical, rather than tapered shank. "Clocking" of screw-driving operations and pull tests in wood assembly plants reveal that



View in laboratory of the North American Mfg. Co., Cleveland, Ohio, well-known maker of combustion equipment for gas and oil. Inclinometer on left measures amount of air; the one on right, the amount of gas. Not shown are test stations using Meriam Manometers for testing burners, valves, etc.

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With these two Meriam Inclinometers North American technicians read the cubic feet per hour of air and gas flowing to their combustion equipment during test. The inclinometer pressure-temperature compensator unit is set for the actual operating temperature and pressure of the air and gas flow. Using several Meriam orifice plates the correct flow is measured on the inclinometer scales. Without this equipment, extensive calculations involving a day's time would be required.

Meriam instruments are used throughout industry for measuring pressures and flows of liquids and gases. Accurate, dependable and timesaving, they contribute much to the efficiency of testing. Supplied in both standards and specials to meet all needs. Complete information on request.

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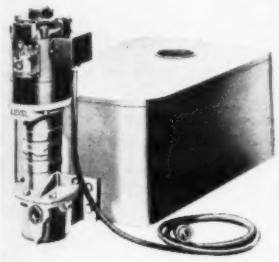
use of these TWINfast wood screws cut driving time in half and increase holding power.

*Available from:* National Screw & Mfg. Co., and Rivco, Inc.

E-315

### Power Pump for Cutting Fluids

*Features claimed:* Can be used on most wet machine tools. A single unit as shown meets the needs of a multiple-spindle drill press up to 8 spindles. Pump is of centrifugal type, mounted directly to the tank with a flat machined flange. No piping required from pump to tank. A six-blade impeller is connected directly to motor shaft. Models available from 6 to 32 gals. per minute. Motors of various electrical characteristics available. Tank has 16 gallon capacity. A settling basin and wire-mesh screen keep the coolant free of chips. Nozzle is fully adjustable from full flow to a trickle.



*Available from:* Delta Power Tool.

E-316

### Rust-Resisting Finish Without Electric Current

*Features claimed:* "Atomite" processing provides a deep black rust resisting finish by immersion (no current used) for carbon steels and steels of low chromium content, and can be used in place of zinc or cadmium on steels. Choice of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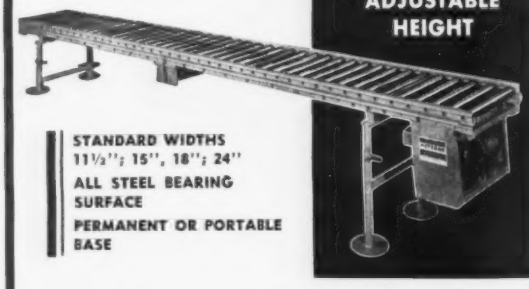

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E-317

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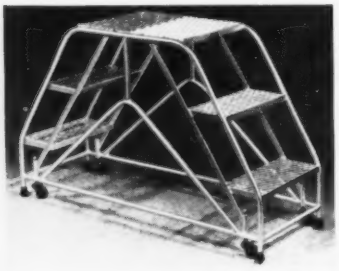

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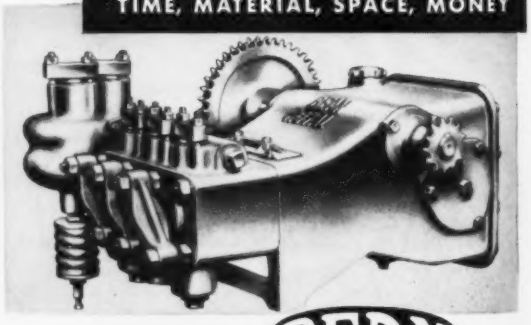

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318-L

## Drop Forged Catalog

A 4-page catalog covering drop forged items manufactured by *Schmitt Steel Company*, 2765 N.W. Nicolai St., Portland, Ore., is now available. This illustrated catalog covers anchor and chain shackles, pedro, grab and reversed eye hooks, open turnbuckles, and other items produced for the industrial and marine trades.

319-L

## Truck for Steel

Featured in a new Straddle truck catalog just issued by the *Hyster Co.*, Portland, Ore., is the Model "MHS," especially designed for handling steel. A variation of the standard 30,000-lb. capacity Model "MH" Straddle truck, the new model is intended for extreme service encountered in materials handling in the metal industry, or other operations where service is unusually severe.

320-L

## Developments in Protective Coatings

New literature and patent surveys covering protective coatings on metals are available from the *Office of Technical Services of the U. S. Department of Commerce*, Washington 25, D. C. The survey, prepared by the Quartermaster's Philadelphia Research and Development Library, emphasizes developments in the field since 1940. Entries include summaries or abstracts, as well as author, inventor and patent indexes. This booklet sells for $1.50.

321-L

## Universal Lubricating Systems

Universal hydraulic grease fittings, couplers, swivel couplers, control handle for boosting grease pressures to 12,000 lbs., and top oiler for upper cylinder lubrication are illustrated and described in the 14-page 1951 Industrial Catalog. Designed so that additional pages can be added, the catalog is available on request from *Universal Lubricating Systems, Inc.*, 849 Allegheny Ave., Oakmont, Pa.

322-L

## Helpful Info on Chain Drives

*Atlas Chain and Manufacturing Co.*, Philadelphia, publishes a new handbook and catalog containing helpful information for engineers, executives and maintenance men concerned with chain drives. The volume is packed with suggestions on how to install, maintain and operate roller chain. It tells how to plan chain drive layouts; offers valuable hints on lubrication and roller chain selection; and contains length conversion tables, horsepower rating charts, list prices with specifications for all types of roller chain and extended pitch conveyor chain.

323-L

## One-Man-Gang for Handling

A new standard accessories folder, captioned "Extra Arms and Hands for Towmotor One-Man-Gang," is available from *Towmotor Corp.*, Cleveland, Ohio, manufacturers of fork lift trucks, tractors and accessories for materials handling. The folder pictures the various accessories provided by Towmotor for fast, cost-cutting mass handling of unusual materials and special types of loads. Attractively printed in color, the folder shows such Towmotor accessories as the crane arm, extension back rest, unloader, scoop, side shifter, cotton truck, hydraulic scoop and many others.

324-L

## Worm Gear Drives

*Cleveland Worm & Gear Co.*, 3249-59 E. 80th St., Cleveland, Ohio, has for you a folder on vertical drives, standard units, and worm-gear sets, speed reducers.

325-L

## Hole Punching System

An attractive, illustrated brochure introduces, illustrates and describes the Wales Multiple Hole Punching System that speeds


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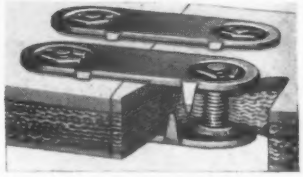

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up production by permitting the entire set-up to be made outside the stamping press or press brake. In this new system of punching holes in sheet metal parts, the Wales Punch and Die Units are interchangeable, permitting the same units to be used and reused in an infinite number of set-ups. The brochure is available from *Wales-Strippit Corp.*, 345 Payne Ave., North Tonawanda, N. Y.

326-L

### Magnetic Pipeline Trap Bulletin

*Eriez Manufacturing Co.*, Erie, Pa., issues a 2-page, two-color bulletin on the "Eriez Magnetic Pipeline Trap." This pressure-tight device is used in the food, chemical, ceramic, and other industries to remove tramp iron from pipelines carrying liquids and semi-liquids. Complete description, specifications and various advantages are listed for the magnetic trap.

327-L

### Lubrication

A 56-page booklet on lubrication is yours if you write *Fiske Brothers Refining Co.*, 129 Lockwood St., Newark 5, N. J., and ask for Lubriplate Data Book No. 1-50.

328-L

### Fork Trucks Illustrated

An 8-page descriptive bulletin released by Baker Industrial Truck Division of the *Baker-Raulang Co.*, Cleveland, Ohio, translates into user benefits the design and construction features of its FT fork trucks in 3,000 and 4,000 lb. capacity. The bulletin contains pictures and descriptions of major components of the trucks and attachments, dimension drawings showing maneuverability, detailed specifications, and pictures of these trucks working in different industries and applications.

329-L

### Complete Bending Manual

"It's Easy to Bend" is the title of a new 32-page bending manual just published by *O'Neil-Irwin Manufacturing Co.*, Lake City, Minn. The manual contains illustrations of rotary type bending machines in all types of operations. The detailed instructions for completing many bending operations should be extremely valuable to anyone interested in the bending of metals.

330-L

### Operating Valves

A new technical bulletin describing the Ross 880 series of hand and foot valves developed for quick control of small cylinders and for pilot operation of master valves is issued by *Ross Operating Valve Co.*, 120 E. Golden Gate Ave., Detroit, Mich. Installation data, engineering drawings and explanations of interchangeability of parts and ease of modification are included.

331-L

### Complete Dryer Bulletin

The industrial and agricultural application of the more than 30 types of Standard-Hersey Dryers are discussed in a comprehensive bulletin just issued by the *Standard Steel Corp.*, 5001 Boyle Ave., Los Angeles, Calif. Continuous and batch dryers and rotary kilns, coolers and calciners are described and illustrated. Also discussed are dryer construction features and the engineering and production facilities offered by the Standard organization.

332-L

### Small Plant Management

"Production Management in Small Plants," publication of the *Stanford Graduate School of Business*, is chosen as a defense production aid by the National Production Authority. Written by Frank K. Shallenberger, professor of industrial management, it is intended specifically for the use of the owner-manager of the small plant. The booklet, which sells for 50 cents a copy, is available from Stanford University.

333-L

### Storage Batteries

"Ironclad Batteries for Motive Power Service," a new catalog describing the performance and utility of storage batteries for users of materials handling and haulage vehicles, has been published by the *Electric Storage Battery Co.*, Philadelphia 32, Pa. The catalog consists of an information booklet and five data pages, the latter listing specifications of Exide Ironclad batteries, accessories and miscellaneous parts.

334-L

### Corrosion Control

Well illustrated and documented bulletin on vinyl plastic coatings manufactured by *Casey & Case Coating Co.*, P. O. Box 151, Maywood, Calif., just issued. These coatings


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VARIABLE SPEED PULLEYS
FOR QUICK PRODUCTION CHANGES

Speedability of different operators
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Variation in temperature or humidity
Variation in size or density of materials
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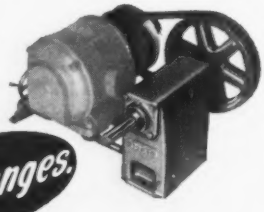

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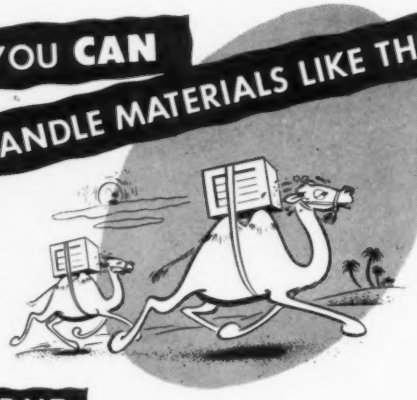

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are for control of corrosion on exteriors of steel, concrete, brick, formed block and plywood structures and as a tank lining. Specific properties are given, a chemical resistance chart is included, plus valuable information concerning application.

335-L

### Weld Spatter-Proofing

A new bulletin, No. 50, from *G. W. Smith & Sons, Inc.*, 5400 Kemp Road, Dayton, Ohio. Gives weld spatter preventives and metal protection compounds, with full details on composition, application, and savings. Free for the asking.

336-L

### Steel Flooring and Armoring

Sixteen-page catalog describing various types of open steel flooring and armoring is available from *Machinery Division, Dravo Corp.*, Pittsburgh, Pa. Can also be obtained from *Joseph T. Ryerson & Son, Inc.* Catalog No. 1103.

337-L

### Abrasive Products

Brochure by *Bay State Abrasive Products Co.*, Westboro, Mass., on their "Koolpore" abrasive products. Good tool room information.

338-L

### Jigs and Fixtures for Welding

Eleven pages, including 26 photos and sketches, illustrate a reprint from "The Welding Journal" concerning jigs and fixtures for inert-gas arc welding. Get it from *Air Reduction Pacific Co.*, 1614 Mills Tower, San Francisco, Calif.

339-L

### Kiln Drying

A four-page color-illustrated folder from *Lumber Manufacturers, Inc.*, Portland, Ore., who specialize in custom kiln drying. Folder indicates type of equipment that the firm uses, type of work the firm does, and advantages accruing to industries that use this service.

340-L

### Testing Boiler Water

A quick and simple method for determining the solids content of boiler water or condensate is described and illustrated in a bulletin just issued by *Hall Laboratories*, Hagan Building, Pittsburgh, Pa. The test procedure utilizes a Hagan Conductivity Meter in conjunction with a cell, a Hagan Dial Thermometer, a conductivity cylinder and a supply of Conductivity Reagent A.

341-L

### Weights and Terms for Pine

*Western Pine Association*, Yeon Bldg., Portland, Ore., publishes a folder entitled "Western Pine Terms and Conditions of Quotation and Sale and Schedule of Estimated Weights." The terms and weights, which may be modified, are printed in a 4-page folder punched for insertion in a binder.


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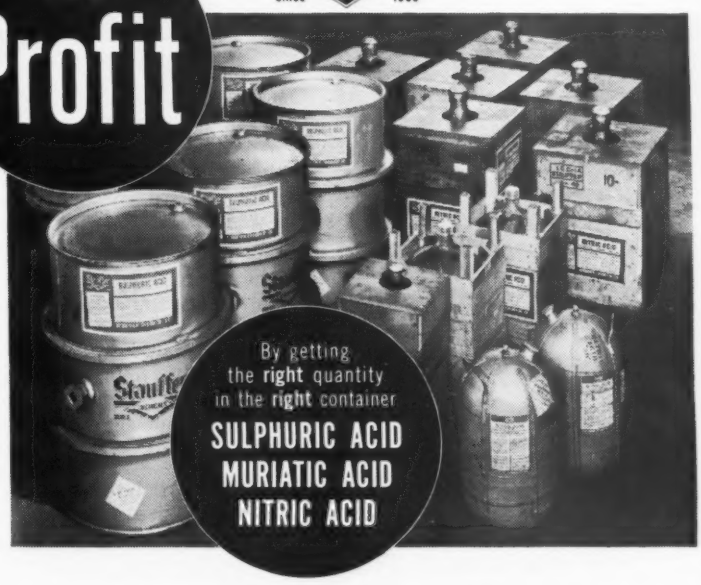


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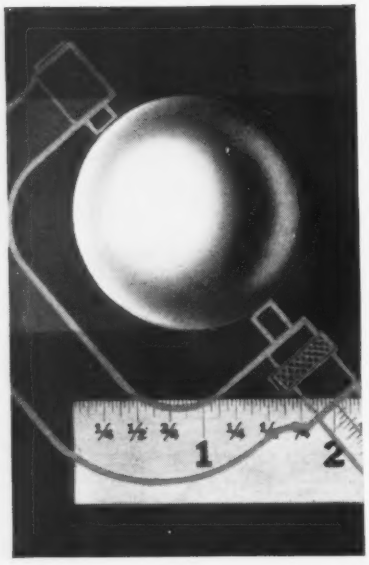

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# READING GUIDE FOR WESTERN MANAGEMENT

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## Climbing the Executive Ladder

By George J. Kienzle and Edward H. Dare, McGraw-Hill Book Co., Inc., New York, 1950, $2.95.

It is a part of the American tradition that there is "always room at the top"; that a determined man can start at the bottom and work his way up; and that grit, perseverance and hard work provide an assured road to success. This concept which burgeoned greatly during the twenties was somewhat frosted during the depression years. Today it blossoms anew. However, as a result of the depression's chilling blast it is stated more cautiously and contains the qualifications that, although there is plenty of room at the top, it takes a man with executive capacity and perseverance in acquiring the necessary administrative skills and knowledge to reach it.

For those desirous of obtaining the equipment needed to scale the executive heights, authors Kienzle and Dare have prepared a guide. Their book, *Climbing the Executive Ladder,* provides a "self-training course for people who want to succeed." It deals primarily with human relations and treats with the success factors other than job knowledge in business. The authors show the kind of people and problems encountered in business and suggest ways of handling both. They provide instruction in the important areas of developing one's personality, making the best use of one's abilities and in the art of dealing with others. The book concludes with a self-rating scale which will enable the potential executive to rate himself before he reads the book, and after he has put its advice into practice.

The idea for the book was developed while the authors were preparing a human relations training course for the New York Central System. This background in personnel training shows to advantage in the writing which is replete with examples and cases illustrating the authors' points. Although it contains little that is new this book includes a great deal that is true—presented in an interesting manner. Here is a book that every supervisor of people could read with pleasure and profit.

Reviewed by:
HAROLD E. ATKINSON
*Lecturer in Human Relations*

## Briefer Guides from The Management Library

### Company Food Services

National Industrial Conference Board, New York, Studies in Personnel Policy No. 104, 1950.

This report brings together the experiences of 138 diversified companies in providing some kind of company food service. Types of service described are those operated by management, by contractors or individual operators, and by employee associations. It was found that a well-managed company food service improved employee morale, health, production and attendance.

### Grievance Procedures in Nonunionized Companies

National Industrial Conference Board, New York, Studies in Personnel Policy No. 109, 1950.

In a survey of grievance procedures for non-union workers 57 companies answered such questions as: What is considered a grievance? What are the steps in the grievance procedure? Are workers paid for time spent presenting grievances during working hours? Are grievances required to be put in writing? Is employee participation provided for in grievance review?

### Personnel Problems Under Mobilization

American Management Association, New York, Personnel Series No. 135, 1950.

Includes: Security and loyalty considerations in personnel administration. Economic policy faces the future. Management's challenge in the coming decade. Approaches to economic education—an appraisal.

### If an A-Bomb Falls

National Industrial Conference Board, New York, Studies in Personnel Policy No. 108, 1950.

This report, describing protective measures that can be taken against the effects of an atomic explosion, outlines an over-all disaster plan and gives specific information about the effects of atomic explosion. Graphic illustration is furnished by charts and tables.

Reviewed by:
BERNA M. CARLSON
*College Librarian.*

# THE WEST ON ITS WAY

## ARIZONA

PIPE THIS ONE—The Southwest will benefit by an increased supply of natural gas upon completion of an $83-million construction program by El Paso Natural Gas Company. Arizona, New Mexico, and Texas are slated to receive an additional 100 million cubic feet. 150 million cubic feet will go jointly to Southern California Gas Company and Southern Counties Gas Company of California, and 150 million more will be delivered to Pacific Gas & Electric Company. 93 miles of pipe will be added to El Paso's transmission lines to carry the extra load.

COTTON GALORE—Yuma will be the site of California Cotton Oil Corporation's new gin. The six-stand facility will cost about $150,000 and will be ready to take care of this year's cotton crop. About 8 workers will be required to man each turn of the gin.

WATTS NEW—Included in the proposed 1951 construction budget for Arizona Edison Company are new generating units for the Yuma, Douglas, and Ajo Heights plants. During the past three years the company has conducted an expansion program amounting to $6,500,000; the 1½ to 2 million expenditure planned for this year is a continuation of the post-war design.

## CALIFORNIA

ANOTHER FONTANA?—Yolo Iron & Metal Co. incorporated, wants to build $264 million steel mill in central California, using ore from five California counties (one of them Lassen) claimed to run better than 50% iron content. NPA requested for authorization. Frank I. O'Neill, Oroville, G. I. Dummond, Sacramento, are directors. F. H. McGraw & Co. reported as prospective builders.

CHROME PLATED PRODUCTION—Purchase of the Dr. Pepper bottling plant in Los Angeles enables Royal Metal Manufacturing Company to change from assembly to production manufacturing. The expenditure of $210,000 makes this manufacturer of chrome plated office and other furniture almost entirely independent of its parent company in Chicago. The plant, at 5950 Avalon Blvd., covers 40,000 sq. ft. of floor space.

CALIFORNIANS OUTGUZZLE THEMSELVES—According to the monthly summary for December, 1950, prepared by Wine Institute for the Wine Advisory Board, apparent consumption of California wines nationally totaled 120,033,842 gallons in 1950, the second-highest figure in industry history. The figure was 2% above the 117,700,740 gallons recorded for 1949. The December total included 1,901,443 gallons of table wines, 6,587,340 gallons of dessert wines and 53,934 gallons of sparkling wines.

MORE GINS—Anderson, Clayton & Company expect to spend $300,000 for two new cotton gins, one for El Centro and one for Brawley. Completion is scheduled for early July.

OPTICAL OUTFIT—McCullough Motors Corporation forms a new subsidiary, located adjacent to the McCullough gas engine manufacturing plant on Century Blvd., in Los Angeles. The addition to the corporation has been christened Pacific Optical Company, and will produce in mass quantity plastic aircraft enclosures, glass or plastic lenses and prisms and other optical products.

NEW DOORS FOR PENINSULA PLANT—To replace its former plant destroyed by fire, Nielsen-Beaver, Inc., San Carlos-Belmont door-making firm built a 16,000 sq. ft. establishment, recently dedicated. The $300,000 plant can turn out some 1,200 doors per day.

DOWN THE STREET—Since January 1, 1951, the address of the Inertol Company, Inc., manufacturers of waterproofing and


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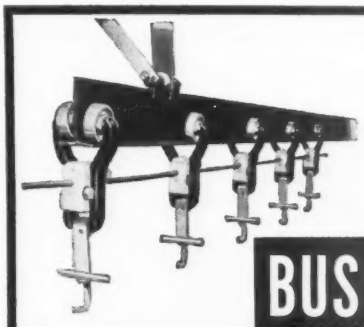

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THE E. W. BUSCHMAN CO., INC., 4428 Clifton Ave., Cincinnati 32, Ohio

protective compounds for concrete and steel has been 27 South Park, San Francisco 7, Calif. The plant was located formerly at 19 South Park.

ARMY CONTRACT WON BY PACIFIC CORPORATION—Pacific Airmotive Corporation of Burbank announces its entrance into a contract with the Air Forces for $4,600,000-worth of overhauling on an undisclosed number of large four-engine Air Force cargo-transport planes. All the work will be processed at the Pacific Airmotive Airport Division near Chino, and the peak personnel load is expected to reach 1,200—340 over the 860 presently employed.

PLANES FOR THE ORIENT—Pacific Airmotive Corporation of Burbank is sending a large shipment of Packard (Rolls Royce) Merlin aircraft engines to Generalissimo Chiang Kai-shek's Nationalist Chinese forces on the island of Formosa.

GREATER AVIATION ELECTRONICS PROGRAM—An enlarged development program on missiles, instrumentation and other electronic projects is under way in the new Development Laboratories of Pacific Division, Bendix Aviation Corporation. The research laboratories now have their own building at 166 West Olive Ave., Burbank, and more than twice the space they formerly occupied. The new quarters provide 50,000 sq. ft. of floor area.

JACKS IN A NEW BOX—Osborne Machinery Company of San Francisco become the new owners of the hydraulic aircraft jack division of Menasco Manufacturing Company of Burbank. Business will be done under the name of Malabar (the trade name) Manufacturing Company, division of Osborne Machinery. Menasco has effected the change in order to use its Burbank plant for increased production of military airplane landing gears. Its production capacity will be more than doubled, and additional equipment and personnel will aid in meeting the expanded schedule.

WIRE PRODUCTS CO. EXPANDS—California Wire Products Co., 516 No. Tipton Ave., Visalia, moves from that address to a newly purchased building at 328 North East Third, Visalia. New building has 60% more space than the former rented quarters.

PLANT DOUBLES DAILY OUTPUT—Military vehicle tires are now being produced by Pacific Tire & Rubber Company of Oakland. The $2 million contract recently awarded will necessitate an increase in personnel from the present 250 to 400 by July, and tire output will reach 4,500 per day at full plant capacity. Pacific Tire recently became affiliated with Inland Rubber Corp. of Chicago.

EXPANSION FOR DEFENSE WORK—Plans for erection of a new plant in Montebello are formulated by Axelson Manufacturing Company of Vernon, California. The factory, number three for Axelson, to be situated on a 44-acre site, will be built to accommodate defense work. Axelson manufactures landing gears for aircraft, oil-pumping equipment, heavy duty lathes and machine tools.

ENGINEERS MAKE POWER SURVEY—In order to mitigate deficiencies in Northwest power capacity, construction of a 230,000-volt power line connecting Shasta Dam and the southern end of the Columbia River system is contemplated. Hearings for construction appropriations will take place in Washington. An immediate survey for the line is to be undertaken by Bureau of Reclamation engineers.

MAGNESIUM PLANT CHANGES HANDS—Merck & Co., manufacturing chemists, have become West Coast property holders with their purchase of Marine Magnesium Products Corporation of South San Francisco. The $2,120,000 transaction will effect no change in operation of the plant; Marine's magnesium salts business will be continued with the same facilities and personnel. Merck has obtained options to buy 140 acres of tidelands in the area as well as 100 acres on Point San Bruno, in addition to the 7½ acre plant-site.

OAKLAND BENT FOR LEATHER—The Magadiz Company, manufacturers of dyes, spray dressings and finishes for leather, has crossed the Bay. Their old and smaller plant was located at 74 Tehama Street in San Francisco; presently the firm may be found at 424 Third Street in Oakland.

JETS FOR THE ARMED FORCES—Lockheed Aircraft Corporation's Burbank plant is accelerating production of their F-94 jet, due to increased military contracts. Engineering staffs are working overtime and almost half of the 18,000 currently employed Lockheed personnel have been assigned to speed up production on the unique plane.

NEW BENZENE PLANT AT EL SEGUNDO—Standard Oil Company of California, responding to a recent government request for increased benzene production, will build a benzene plant costing in excess of $10,000,000 at its El Segundo refinery in


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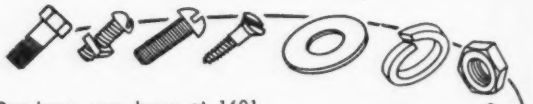

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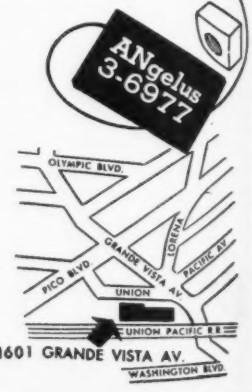


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Southern California. The new plant is being designed to turn out 13,000,000 gallons of benzene annually, and the daily manufacture of toluene, for which there is an urgent need in aviation gasoline, is expected to reach 3,200 barrels. The planned El Segundo facilities will be built around a new platforming process developed by Universal Oil Products Company.

KAISER SUBCONTRACTS FOR PLANE PARTS—Kaiser-Frazer becomes the seventh large firm to join Lockheed Aircraft Corporation's group of sub-contractors. A contract between the two corporations provides for the fabrication and assembly of components for the Lockheed P2V, Navy anti-submarine patrol plane. The sections to be built will be manufactured at the Kaiser-Frazer aircraft division plant in Oakland, where production work is scheduled to start almost immediately.

NEW PLANT PLYS TRADE—Installation of modern equipment precedes production in the new plant of Arcata Plywood Company in Arcata. Panel making equipment will later be installed.

THE BIG FREEZE—Direct processing will replace custom freezing this year by the Central California Berry Growers Association at San Jose. A 35-ton a day capacity is planned, with a 50% increase instituted when necessary. Fresh stemmed berries will be sold to buyers who will do their own freezing, and the minimum of 2½ million pounds planned for 1951 freezing will be increased if market conditions are favorable.

CANNERY OWNERSHIP TRANSFERRED—Plant improvement and modernization of Martinez Food Canners, Ltd. factory at Martinez follows its purchase by Sidney Ross and a financial group he heads. The new organization will operate all previous equipment except that for fish processing. Can sizes of other fruit and vegetable products will range from picnics to No. 10's. Most of the pack will be for buyer's label, although some output will be under house label.

THREE OF A KIND—Swedlow Plastics Company has opened a third plant at 3436 Malt Avenue, Los Angeles. Also occupying offices at the same address will be their Sales and Contracts Administrative Department.

CRUSHING DEVELOPMENT — News comes from Bishop that the United States Vanadium Corporation has improved its Pine Creek tungsten properties by installing a new crushing unit. Cheelite (1,500 tons processed daily) and powellite processing are expedited; more than 2,000 tons of tailings from the Atolia district will be handled. Pine Creek operations are now at normal capacity, with personnel numbering 220.

## COLORADO

KILOWATTS FOR COLORADO—Public Service Company of Colorado plans to construct a new 60,000-kw. generating unit to the tune of $11 million, part of a $24,600,000 1951 construction budget which has just been approved. The generating unit is scheduled for completion in 1953. The additional $13,600,000 will be spent on electric transmission facilities ($2 million), electric distribution lines, services, transformers, and meters ($5 million), generating facilities ($1 million), and gas distribution lines and facili-


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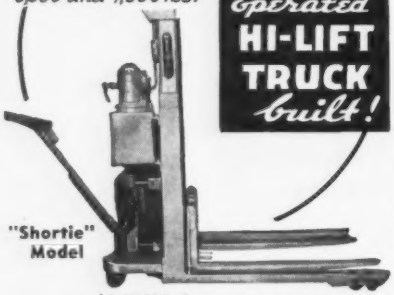

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ties ($5,600,000). When the new facilities are in operation, the utility's generating capacity will be 440,000 kw.

A SWEET DEAL—California farm land changes hands as American Crystal Sugar Company of Denver deeds 6,846 acres formerly in its possession to Tempo Industries of Los Angeles and Oxnard Farmlands, Inc. The property, located near Oxnard, has, during the nearly fifty years of ownership by Crystal, been used for production of beans, sugar beets and alfalfa. American Crystal's California operations will not be curtailed by the sale, officials say.

FIRE THREE—Modernizations and improvements will boost Colorado Fuel and Iron Corporation's budget $26,200,000 this year. Two 225-ton open hearth furnaces will be constructed, a blast furnace will be rebuilt and a new high-speed rolling mill will be installed. In addition to in-the-plant innovations, a coal mine, above the company's Frederick mine and 27 miles west of Trinidad, will be developed. Total capacity of the plant will equal 1,645,000 tons upon completion of improvements, 325,000 of which will be due to the new open hearth furnaces and 45,000 to the renovated blast furnace.

## NEVADA

MAKE MINE MANGANESE—A possible 24,000 tons of manganese alloys will be added to the stockpile of the critical war material if the munitions board approves the allocation of power to The Combined Metals Reduction Company for their plant at Henderson, Nevada. The Colorado River Commission has already approved the 34,000,000 kw. hours per year apportionment. The old Basic Magnesium plant will be the site of operations where the installation of an electric furnace, estimated to cost in excess of $350,000 by the time of its completion next June, will be the literal powerhouse for the manganese alloy production. Further expansions at the Pioche and Goodsprings mining districts will increase hydrometallurgical treatment of oxidized ores. Lead, zinc, and manganese will be produced at Henderson plant from the latter basic minerals.

SCHEELITE DEVELOPMENT — Scheelite holdings in Spanish Canyon, Austin area, are to be developed by Marston Enterprises of Beverly Hills, with subsequent construction of a tungsten concentration plant planned.

BUREAU DRAWS PLANS — September should see in operation the new manganese pilot plant now being built by the United States Bureau of Mines at Boulder City. Ore from the Artillery Peak area near Kingman, Arizona, is specifically designated for process there, although ores from other areas will be handled at the $600,000 plant.

TO GET THE LEAD OUT—Transportation costs to Salt Lake smelters may be eliminated for the Sun Battery Company and other lead-zinc miners in Death Valley upon the decision of Sun Battery to erect a concentration plant for lead-zinc ores. The 18 lead claims of Sun Battery near Bonnie Clair have undergone extensive development within the last few years. Metal reserves are thought to exist in the surrounding area. Completion of a highway to Scotty's Castle in Death Valley would further augment the possibilities of local grist for custom milling.

## OREGON

BRANCHING OUT—Hudspeth Pine, Inc., of Prineville, Oregon, has paid $5,350,000 to become one of the largest pine lumbering businesses in the Western pine area. Their holdings now embrace 50,000 more acres of timberland. Stands of ponderosa pine and milling properties formerly owned by the Blue Mountain Mills, Inc., and the Blue Mountain Land Company, including the John Day and Dayville units, are now among their possessions.

MORE COOKIES PER CAPITA—Employing about 750 persons, National Biscuit Company's newly-dedicated plant in Portland is that city's largest post-war industry.

MUNITIONS CONTRACT — $1,000,000 worth of booster assemblies for artillery shells will be produced by the Screw Machine Products Company under terms of a contract awarded by San Francisco ordnance district to the Portland firm. The plant, located at 536 S.E. 6th Ave., is the first one in the city to win a munitions contract in the present emergency.

MORE PLYWOOD—5,000,000 square feet of plywood a month is the expected capacity of the plywood plant planned by the W. A. Woodward Lumber Company of Cottage Grove. This plant will be constructed next to the company's sawmill and probably will be in operation by the fall of this year.

NICKEL MINES TO BE OPENED—Oregon's nickel deposits, long known but virtually unexplored, are to be exploited for the first time. The M. A. Hanna Company of Cleveland has taken a purchase option on property near Riddle, in southern Oregon and will experiment with methods for economical mining. The deposits, although low-grade, are important due to war needs.

ALASKA IN THE LIMELIGHT—Construction of a plant in Portland to produce high quality lime from Alaskan ore is planned by U. S. Lime Products Corp. of Los Angeles. Properties at Edna Bay, Alaska, have been leased from Aluminum Co. of America; Alaska's Kosciusko Island will furnish the limestone. The plant will cost $1,500,000 and well employ about 400.

## UTAH

EXPANSION ON EXPANSION — Filtrol Corporation is not only building a new plant, but planning its expansion before the initial construction is finished. A $3,000,000 structure is being built in Salt Lake City to expand Filtrol's activities in the field of chemical agents. The Corporation is a primary producer of adsorbents, catalysts and desiccants, and has other installations in California and Mississippi as well as mining properties in four other states.

INDUSTRY MOVES WEST—Utah Construction Company awarded a contract by Commercial Shearing & Stamping Company of Youngstown, Ohio, for building of its fabricating plant in Salt Lake City. $750,000 will be expended on the 20-acre site, with the resulting enclosure amounting to 32,500 square feet of floor space. Steel from the nearby Geneva Steel Company plant will be utilized in production operations, expected to begin in the late summer. Areas served will include the Pacific Coast States, Colorado, Idaho, Wyoming, and New Mexico.

# WASHINGTON

MAGNESIUM PRODUCTION—In addition to continuing its production of ferro-silicon, Pacific Northwest Alloys, Inc., subsidiary of Chromium Mining & Smelting Corporation, is slated to undergo plant expansion and personnel increases for the production of magnesium. The plant, located near Spokane, has been awarded a Government contract. Expected rehabilitation will cost $1,500,000. Approximately 500 men will be added to the payroll.

REINCARNATED BONANZA—Anaconda Copper Mining Company puts out approximately $2 million, it is reported, for the old Bonanza lead mine in Northeastern Washington. A 100-ton mill and 1,900 acres of surrounding mineral land are included in the transaction; the adjoining 320 acres are being acquired separately. The Bonanza was thought to be "worked out" until bought 7 years ago by the present sellers.

ZINC-LEAD ORE MILL IN OPERATION—Pend Oreille Mines and Metals Co. starts operating the first of three units of a new 2,500-ton mill at Metaline Falls, Wash. When all units are operating as anticipated at the end of 1951, they will be concentrating zinc-lead ore at the rate of 3,000 tons daily.

IN THE WIND—Funds contributed to University of Washington by the Boeing Airplane Company will finance modernization of the F. K. Kirsten Aeronautical Wind Tunnel. Major improvements will be the sound-proofing of the interior of the tunnel and the installation of a new balance system to provide improved methods of model testing. Under terms of the agreement, whereby Boeing may pay out up to $40,000, the airplane company will have priority on the use of the tunnel during the next two years while its own aerodynamic laboratory is undergoing modernization.

NO PIPE—NO GAS—Basing its report on Alberta's natural gas needs for the next 30 years, the Alberta Petroleum and Natural Gas Conservation Board recommended against exports. The provincial government has accepted its premises and has decided to turn down the petitions of 5 pipe-line companies to move the commodity from Alberta to the Pacific Northwest and thence to Winnipeg. The government intimated that when Alberta's natural reserves are adequate, or if the international situation demands it, the export project will proceed.

FROZEN ASSETS — Cedergreen Frozen Pack Corporation is no longer operating its Mt. Vernon and Grandview frozen food plants. Libby McNeill & Libby of San Francisco is the purchaser, $900,000 the price. Cedergreen used the trade name Polar Frosted Foods for its products.

WESTERN POWER EXPANSION—The Bonneville Power Administration's Mead substation will soon be the largest one West of the Rockies. Additions, to cost $2,600,600, have been advanced to this year to relieve critical shortages in the Pacific Northwest defense production area. Several large industries, including Kaiser Aluminum & Chemical Corporation, the Spokane magnesium plant, The Harvey Machine Company (aluminum), The Victor Chemical Works (phosphorus), will benefit by the installation of terminal switching facilities for two new 230,000-volt transmission lines, a 13,800-volt feeder rack and the all-important integration of the Hungry Horse Dam storage and western Montana with the federal power grid.

ANOTHER DAM—Southwestern Washington is to be the site of a $26 million hydro-electric dam, designated as the Yale project. Pacific Power & Light Company, fathering the project, announces that the dam, to be situated on the Lewis River immediately upstream from the company's Merwin Dam, will generate 100,000 kw. Its eventual capacity of 200,000 kw., following the installation of two more power units of 50,000 kw. each, will be part of the projected potential of the Lewis River to generate 500,000 kw. The arch-type dam to reach a height of 285 feet, will be built as a defense project and may be in production by the fall of 1952.

BACK TO THE WOODS—Camas, Washington, is chosen by Crown Zellerbach Corporation of San Francisco, for the site of its new Development Laboratory. Construction will be begun immediately on the steel frame structure, which will house facilities for accurately approximating the whole range of papermaking. The two-story building will contain 15,000 square feet of working space on the main floor and about 1,500 on the second, all of which will be used for experimental work that begins essentially beyond the research laboratory benches. Ultimate plans call for erection of a new Research Laboratory on the same site, to the west of the Development Laboratory.


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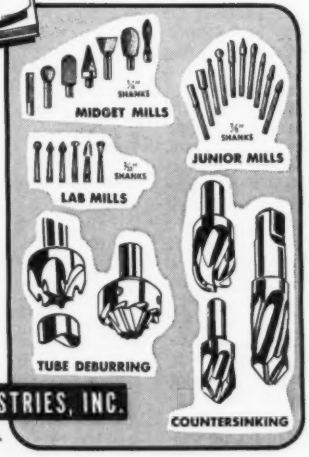


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# WESTERNERS AT WORK

## California

OAKLEY DEXTER becomes new senior officer of *Crown Zellerbach Corp.*, Seattle division, replacing D. S. DENMAN, vice president, who has been transferred to San Francisco, as a member of the executive committee.

*Oakland Aircraft Engine Service*, subsidiary of *Transocean Air Lines*, Oakland, now has W. G. MCDOWELL as president and THOMAS F. LEWIS as vice president.

H. G. MORTON, becomes divisional personnel director at Albers Milling Company Oakland plant. He has been assistant to WALLACE JAMIE, general personnel director of Albers.

JAMES KAISER, formerly supervisor of the Mendocino National Forest, is now manager of the new *Glenco Forest Product* operation at Elk Creek, Calif. Kaiser, who served with the U. S. Forest Service for 18 years in California, will oversee the 35,000-acre timber holdings and the new sawmill which is expected to be in operation by early summer. CAL and HARDIE SETZER are president and vice president respectively of the company.

W. G. ANDREWS becomes executive vice president and general manager with *Electrofilm Corp.*

*Andrews*

*Osborn*

*Aerol and Airquipment* companies, *Lockheed* subsidiaries, now have RALPH OSBORN as vice president and general manager. EDWIN H. ANDERSON succeeds Osborn as sales manager of Airquipment, and ROY A. MACKENZIE becomes vice president of manufacturing.

*Pacific Motor Trucking Co.* now has L. B. YOUNG as president and C. P. HOTTLE as vice president and general manager.

HARVEY GERWIG is new chief design engineer for the *Vultee Aircraft Corp.*, North Hollywood. LEE BALDWIN resigned from the position.

HARRY W. WOODHEAD and DONALD DOUGLAS, JR. are now vice presidents of the *Douglas Aircraft Co., Inc.*

The new mine superintendent for the *Idaho-Maryland Mines Corp.*, Grass Valley, is NEIL WHITING. He will handle the Maryland and Brunswick properties succeeding J. C. O'DONNELL, who resigned.

Officers of *Preco, Inc.*, Los Angeles, are now HERBERT J. WIEDEN, president; CLARENCE NISSEN, vice president, secretary-treasurer; ED ZUCHELLI, vice president, sales; PAUL K. BEEMER, vice president, engineering; L. FORT ETTER, vice president, production.

*Lusch*

A newly created department at *Bethlehem Pacific's* San Francisco offices has JOSEPH J. LUSCH as manager of orders and schedules. He is in charge of the entry and handling of orders and the scheduling of all products produced in the company's steel plants in Seattle, San Francisco, and Los Angeles.

COLONEL "LUKE" HARRIS joins *Pacific Airmotive Corp.* in the newly created post of general production manager. He takes charge immediately of the Burbank engine and aircraft divisions and the Chino aircraft division.

D. R. THOMPSON is now acting manager of the products department of the *California Fruit Growers Exchange*. M. L. CHAPMAN, former manager, resigned.

FRED HOSTERMAN joins *Western Hydraulics, Ltd.*, as chief sales engineer and design consultant.

DOROTHY FULLER is new purchasing agent for *Gertsch Products, Inc.*, Los Angeles. She was for several years on the office staff of Hoffman Radio Corp., Los Angeles plant.

Three advancements in the *Thomas P. Pike Drilling Co.* are STANWOOD I. WILLIAMS, promoted to executive vice president; H. G. HANEY to manager of drilling operations, and JOHN FOWLER, as drilling superintendent.

ROBERT R. APPLEGATE joins the staff of the *Mir-O-Col Alloy Co.* of Los Angeles, as metallurgical engineer.

C. T. WEITZEL of the *Mechanical Specialties Co.*, Los Angeles, leaves soon to become a member of the Advisory Committee of the National Production Authority as the representative of the tool and die manufacturing industry.

Three men in the *Kaiser Industries*, Oakland, hold new positions. WALLACE A. MARSH takes over as vice president and general manager of *Permanente Cement Co., Glacier Sand and Gravel Co.*, and *Permanente Steamship Co.* CLAUDE E. HARPER becomes vice president and general manager of the *Kaiser Gypsum* division and ROBERT S. BARNEYBACK is vice president and general manager of the *Kaiser Co. Sand and Gravel* division.

D. J. GALEN moves up to vice president of the *Crown Zellerbach Corp.* of San Francisco, and will be in charge of purchasing. Promotions also go to RICHARD G. SHEPHARD, new assistant to the president, WILLIAM D. WELSH, who will head public relations, P. F. MIDDLEBROOK, now director of employee relations, J. T. HUGHES, supervisor of employee benefits, and HERBERT NYLUND as assistant treasurer.

GIL HAFNER returns to *Hoffman Radio Corp.*, Los Angeles, as general superintendent in charge of production and maintenance.

In Long Beach, P. E. FOOTE is the new president of *Petrolane, Ltd.* He succeeds the late CHARLES E. MCCARTNEY, founder of the liquid petroleum gas organization.

New vice president in charge of operations for the *Pacific Can Co.* is P. F. LINDEMAN. M. J. RUSSO is vice president in charge of purchasing for the San Francisco firm.

NEAL J. COLEMAN is now assistant general manager at the *Pacific Airmotive* Airport division, Chino, Calif.

W. E. JONES takes over as plant superintendent of *Clapp's Baby Foods*, San Jose. He succeeds the late JOHN H. BIER.

HOMER J. FOYE transfers from the Seattle, Wash., plant of the *Link-Belt Co.* to become chief engineer in Los Angeles, Calif., plant. Foye, a University of California graduate in mechanical engineering, replaces MAURICE J. ERISMAN who goes to the Chicago, Ill., plant.

*Foye*

THOMAS O. MCCRANEY is now general counsel and assistant secretary of the *Pacific Airmotive Corporation*, of Burbank.

DONALD PATTERSON takes a step upward to factory manager for the *National Motor Bearing Co., Inc.*, of Redwood City. He replaces COL. B. W. HOLMES, who is returning to active service with the United States Air Force.

*Patterson*

*Golem*

HOWARD G. GOLEM becomes director of procurement for *Consolidated Vultee Aircraft Corp.* of San Diego. He has been closely connected with the material departments for the past 22 years and will now be in charge of subcontracting and purchasing for the company. H. N. May is now chief of material for the San Diego division.

H. W. GEYER, formerly Utilization Engineer, *Southern Counties Gas Co.*, is now director of the West Coast research and development laboratory of Grayson Controls Division, *Robertshaw-Fulton Controls Co.*

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SAN FRANCISCO VANCOUVER, B. C.

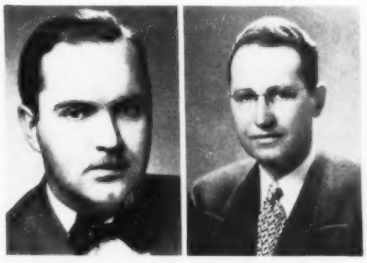
H. G. LAUB resigns from the *Southern California Gas Co.* to devote full time to the *Southwest Gas Corp.*, of which he is president.

WILLIAM A. MOSES, Southern California newspaper man, takes over as publicity department manager of the *Los Angeles Chamber of Commerce*. He replaces RICHARD L. BEAN, who is now in the *Lockheed Aircraft Corporation* publicity department.

W. L. CHADWICK and J. F. DAVENPORT are new vice presidents of the *Southern California Edison Co.* HARRY A. LOTT is now executive engineer replacing N. B. HINSON, who retires.

FRANK RYDER takes over as chief engineer for the *H. C. Little Burner Co., Inc.*, of San Rafael, and HEWITT V. WILSON becomes assistant secretary of the company.

A new West Coast organization in the chemical department of *General Electric Co.* has offices in Anaheim, Calif., with JOE B. HOLMES as supervisor of manufacturing.



*Nelson* *Holmes*

HENRY C. NELSON, supervisor of engineering and HARRY S. KOMER, supervisor of accounting and services. Anaheim is the West Coast site of the G-E Glyptal alkyd resins plant.

## Colorado

WADE H. TAYLOR takes over as regional power manager for the *U. S. Bureau of Reclamation* in the lower Colorado River Basin. He will supervise the technical phases of the hydroelectric power program.

HAROLD D. HERNDON resigns as president of the *Saltmount Oil Co.* of Denver to become a consultant in investments and royalties in San Antonio, Tex.

New executive in charge of *Continental Oil Co.* operations in the Rocky Mountains is J. W. LIDDELL. He will serve in Denver as vice president and general manager of the region. Liddell replaces E. F. BATTSON, who goes to Houston headquarters of the company as administrative vice president.

## Idaho

*Budge*

WILLIAM L. BUDGE takes over as manager of *Western Electric's* Atomic Power division facilities near Idaho Falls. He will be in charge of the work on the Mark I naval reactor, atomic engine for submarine propulsion.

PAUL W. BECK is now in charge of the document files and technical library of the

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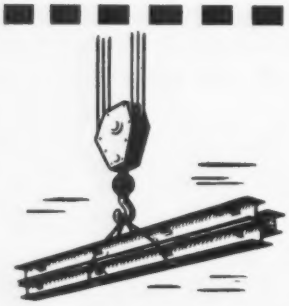
### Montana

ARTHUR C. BIGLEY, former general superintendent of mines for *Anaconda Copper Mining Company*, Butte, Montana, is now manager of the mines. His former position goes to EDWARD J. RENOUARD, JR., former assistant general superintendent of mines. Bigley succeeds H. J. RAHILLY, transferred to New York.

### New Mexico

New plant manager for *Southern Union Gas Company* at Farmington is EDWIN M. IKARD. He is also in charge of operations at Aztec. He succeeds DAVIS BUTLER, now town plant manager at Durango, Colo.

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### Oregon

*Jantzen Knitting Mills* promotions are as follows: RONALD MCCREIGHT, general sales manager, now also a vice-president; ED KLINDWORTH, from outside divisions supervisor to assistant general manager; KENNETH C. SMITH from office manager and chief accountant to controller; WILLIAM PARKER, credit manager; K. REED SWENSON, assistant manager, sweater division.

ZINA A. WISE is new president of the *Griffith Rubber Mills*, Portland. He succeeds FRANKLIN T. GRIFFITH, who is now chairman of the board of directors.

HENRY GOODRICH, *New England Fish Co.* vice president and manager of Oregon operations at Astoria, takes over a New York post to direct distribution activities in the East. DOUGLAS HAGER, formerly assistant manager, replaces Goodrich.

### Utah

J. K. RICHARDSON, formerly executive secretary of the *Utah Metal Mining Association* and more recently industrial engineer for *Kennecott Copper Corporation*, is now on loan from Kennecott to the Defense Minerals Administration and is stationed at Washington, D. C.

New assistant superintendent of the *Kennecott Copper Corp.* at Garfield is KARL H. KOROPP. He will be at the company's electrolytic refinery.

*Glaeser*

Three employees of *U. S. Smelting Refining and Mining Co.* have new positions. OSCAR A. GLAESER is assistant to vice president and general manager of Western operations; M. A. KURYLA is industrial relations engineer, and BYRON E. BRANT is assistant manager of Western Mines. C. A. GREENWOOD, chief chemist at the Midvale plant, is retiring. His assistant for many years, JAMES E. POWELL, succeeds him.

### Washington

*Ponderosa Pine Woodwork* has D. G. PILKINGTON as its new general manager. Pilkington takes over from E. W. RUDDICK, who resigns to join the staff of the *Pacific Mutural Door Co.* in Tacoma.

N. H. GELLERT, JR., becomes vice president in charge of distribution for the *Seattle Gas Co.*

The new-products department of *Georgia-Pacific Plywood & Lumber Co.* gets HAROLD K. WILSON as its manager, with offices in Olympia. He is responsible for application and development of plywood and plywood products in military and industrial fields.

ELVIN BYLES is new secretary and G. O. BAKER, JR., treasurer, of the *Harbor Plywood Corp.* They succeed M. M. PATTISON, who held both positions prior to his death.

NORMAN O. CRUVER of Tacoma gets a new post as price executive for the lumber and wood products division of the Office of Price Stabilization. The door and plywood manufacturer will direct pricing activities affecting manufacture and distribution of Western, Eastern and Southern plywood and veneers as well as other lumber products. He is president of *Cruver Door Co.*, Tacoma and Anacortes.

*General Electric Company's* WILLIAM E. JOHNSON takes over as assistant general manager of the Hanford atomic construction program at Richland. He succeeds FRANCIS K. MCCUNE, now head of G. E.'s apparatus department, Schenectady, N. Y.

Assistant director's post for *Washington Institute of Forest Products* goes to JOHN W. ALLEN, former field supervisor. The institute's logging engineer, T. E. COLLINS, returns to active service as a second lieutenant in the Infantry.

## ASSOCIATIONS ELECT

*Colorado Mining Association:* President, BLAIR BURWELL; first vice president, J. PAUL HARRISON; second vice president, HARRISON COBB; third vice president, CHARLES A. CHASE; fourth vice president, H. S. WORCESTER; fifth vice president, E. D. DICKERMAN.

*National Wooden Box Association:* President, H. H. PEIN; vice president, MORRIS MILBANK.

*California Helicopter Association:* President, ELMER SCHLESINGER; secretary, KNUTE FLINT; treasurer, VAUGHN KRUG.

*American Association of Petroleum Geologists:* President, FRANK A. MORGAN, vice president and manager of exploration of *Richfield Oil Corp.*

*Furniture Manufacturers Association:* President, HERMAN KRANZ; vice president, PERCY SOLOTOY; treasurer, JOSEPH SISKIN.

*American Institute of Mining and Metallurgical Engineers, Southern California, Metals Branch:* Chairman, JOHN RIZLEY; vice chairman, JACK TAYLOR; secretary-treasurer, FRED BOERICKE. *Petroleum Branch:* Chairman, BASIL P. KANTZER; secretary-treasurer, J. S. ALEXANDER. *Mining Branch:* Chairman, T. O. EVANS; vice chairman, HENRY MULRYAN; vice chairman, RICHARD STEWART; secretary, K. DE P. WATSON.

*Engineers Club of San Francisco:* President, LEWIS A. PARSONS; vice president, ERIC S. WARNER; secretary, ROBERT D. DEWELL; treasurer, D. A. STIVERS, JR.

*Fir Door Institute:* President, EBERLY THOMPSON; vice president, CHARLES E. DEVLIN; secretary, J. P. SIMPSON; treasurer, PAUL M. SMITH.

*American Institute of Mining and Metallurgical Engineers, Utah Section:* Chairman, CARLOS BARDWELL; vice chairman, W. G. ROUILLARD; secretary, H. P. ALLEN.

*National Frozen Foods Assn.:* President, T. C. MCCAFFREY, National Fruit Canning Co., Seattle; first vice-president, J. LAWLESS, Frosted Fruit Products, Los Angeles; second vice-president, G. O. BAILEY, Birds Eye Division, General Foods Corp., N. Y.

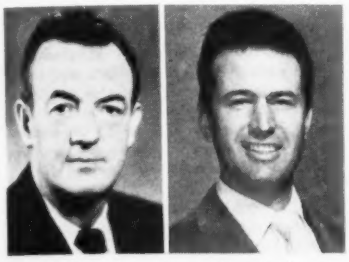
*Western Pine Assn.:* President, WALTER S. JOHNSON, American Box Corp., San Francisco; vice-presidents, U. R. ARMSTRONG, Hallack and Howard Lumber Company, Cascade, Idaho and M. R. PRESTRIDGE, M. R. Prestridge Lumber Co., Almagordo, N. M.; treasurer, C. T. GRAY, Stockton Box Company, Stockton, Calif.

# Western TRADE WINDS

## News about those who distribute and sell industrial equipment and materials

Los Angeles, Calif., is the site of the new West Coast headquarters of *Bellows Co.*, Akron, Ohio. GEORGE COOK becomes the new regional director for sales and services in San Francisco, Spokane, Portland and Seattle. The firm will take over distribution Smith-Johnson Corp., Los Angeles pneumatic equipment producers.

RICHARD T. BARNES will operate out of San Francisco, Calif., as West Coast representative for *Tumb-L-Matic, Inc.*, Bronx, N. Y., tumbling machines and processes manufacturer.



*Barnes* *Cranford*

WILLIAM CRANFORD joins the sales engineering staff of the *Cannon Electric Development Co.*, Los Angeles, Calif. Prior to his appointment he served in various Cannon electrical departments.

*Wilwhite Associates* move their offices in Oakland, Calif., to 385 Seventh Street. The new building offers about twice the company's previous space facilities for office, warehouse and show room.

*Flexitallic Gasket Co.*, Camden, N. J., adds *Transmission Engineering Co.*, San Francisco, to its field organization as a distributor.

A new building to serve as sales headquarters for *Bassick Co.*, division of *Stewart-Warner Corp.*, Chicago, Ill., is now ready

**New plant for Bassick Co. now ready.**

for occupancy in Vernon, Calif. According to O. W. RUDDY, manager of the company's local office, the new structure will provide adequate facilities for carrying stocks to provide prompt service in the Southern California area.

HORACE L. ETHERIDGE, formerly district sales manager for *Pacific Intermountain Express Co.* in the San Francisco-Oakland Bay area, is elevated to the position of national sales representative for the Western territory. He will now have quarters at the general office of P.I.E. at 299 Adeline St., Oakland, Calif. TRAVIS F. GREEN will succeed Etheridge as district sales manager.

CHARLES D. THURMOND, formerly in *Monsanto Chemical Company's* San Francisco office, appointed assistant director of development for the company's Western division, with headquarters in Seattle.

TRUMAN J. CLARK becomes regional manager of *American Pulley Co.*, with offices in Seattle, Wash. He succeeds H. LARSON, who has retired. Clark was formerly with *Northwest Chains & Sprockets, Inc.*, and prior to that, *Poppleton Electric & Machine Co., Inc.*, both of Seattle.

The *Chas. H. Harden Co.* is now located in a new building at 2221 4th Avenue So., Seattle, Wash. The one-story building has approximately 4,000 sq. ft. of space with parking facilities available.

JOHN D. KLINE named manager of the Los Angeles zone for Allison division of *General Motors*, succeeding ALFRED C. STEGER.

*L'Hommedieu*

W. P. L'HOMMEDIEU is named assistant Pacific Coast district manager for *Westinghouse Electric Corp.*, with headquarters in San Francisco. Since 1939 he has been in charge of the sale of electrical apparatus to electric utility organizations in nine Western states, Alaska and Hawaii.

*L. D. McLean & Co.* and *Best Maintenance Supply Co.*, both of Los Angeles, merge under the Best name. L. D. MCLEAN will direct sales of the newly created company, with offices at 811 Traction Ave., Los Angeles.

THOMAS B. MCMEEKIN is entering a new position as sales and service engineer in the San Francisco, Calif., office of the *Nordberg Manufacturing Co.* He replaces GEORGE LIENHARD who has resigned.

*McMeekin*

EDWIN J. HEIMER becomes sales manager of hand lift and motorized hand trucks made by the Philadelphia Division of the *Yale & Towne Manufacturing Co.* Heimer comes to Yale & Towne with nearly 30 years experience in the material handling field. He was formerly vice president of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*Clapp & Poliak, Inc.*, national exhibit manufacturers, at the San Francisco, Calif., office. Heimer was instrumental in founding the National Materials Handling Exposition and was its first general chairman in 1947 and 1948. He managed the Western Packaging and Materials Handling Exposition in San Francisco in 1949 and 1950.

JOHN G. NEUKOM and E. EVERETT SMITH, JR. become partners in *McKinsey & Company*, management consultants, with West Coast offices in San Francisco and Los Angeles, Calif.

*Colson Equipment & Supply Co.* moves into its recently purchased building on Beale

**New office and warehouse for Colson Co.**

St. in San Francisco, Calif. The building will serve as office and warehouse space.

*General Conveyor, Inc.*, is the new name of the *Cleveland Tramrail California Co.* The rechristened organization has also moved its offices from 503 Market St., to 771 Clementina Street, San Francisco.

*Ziegler Steel Service Co.* named Los Angeles and Oakland distributors for Federated Metals Division, *American Smelting and Refining Company's* lead and tin products. Now offering both ferrous and non-ferrous metals in many forms, Ziegler can better serve Western metalworking industry.

STEWART W. WHITE steps up as sales manager of plywood and doors for the *Georgia-Pacific Plywood & Lumber Co.* His headquarters will be in Olympia, Wash.

A. K. TICE is the new assistant to the vice president in charge of sales of *Fruehauf Trailer Co.* Tice joined the truck and trailer company in 1935 and retired in 1947 due to ill health. He came out of retirement to accept a position as manager of the Sacramento, Calif., branch.

*Tice*

*Lomax*

New vice president in charge of sales for the *Industrial Air Products Company* of Portland, Ore., is DAVID H. LOMAX. He has been in the sales department of the rapidly growing welding supply company for seven years. Lomax's appointment comes at a time when facilities are being expanded in Portland, Medford and Spokane.

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*Mobilift Corporation*, Portland manufacturer of Lev-R-Matic drive fork-lift trucks, appoints the *George M. Prescott Co.*, Los Angeles, Mobilift distributor. The Prescott company is a large distributor of materials handling equipment and has warehouse and complete repair facilities.

*United States Steel Supply Co.*, a U. S. Steel subsidiary, appoints WILLIAM J. BORWICK assistant district manager for Los Angeles, and WATSON N. HAARBAUER assistant district manager for San Francisco.

RICHARD N. WHITE assumes the duties of general manager for *Stran Steel Products Co.*, Los Angeles, Calif.

*A. M. Castle & Co.'s* new Seattle, Wash., sales manager is NORMAN JONES. He succeeds the late R. N. VAN DER VERT.

*Libbey-Owens-Ford Glass Company* names A. C. BOLDEMANN district manager for the Pacific Northwest. Boldemann, who has been a field representative for the company in northern California for the past six years, will make his headquarters in Seattle, Wash.

*Green-Penny Company*, Los Angeles, distributors of industrial and materials handling equipment, named exclusive Southern California sales representative for the Cambridge line of woven wire slings, a product of *Cambridge Wire Cloth Co.*, Cambridge, Md.

JAMES C. TAUGHER of the *General Electric Company* becomes meter and instrument specialist for the Pacific Northwest district. Taugher, whose headquarters will be in Seattle, was formerly with G-E's central district in Chicago as application and commercial engineer.

*Joseph T. Ryerson & Son, Inc.*, Chicago, Ill., is now the exclusive warehouse distributor of Rockrite tubing, manufactured by the *Tube Reducing Corp.*, Wallington, N. J.

WALTER G. BEAMAN heads the new branch sales office of *Walter Kidde & Company, Inc.*, New York, N. Y. The new Los Angeles branch will offer sales and engineering service in addition to complete shop facilities.

New sales operations in the Rocky Mountain area will be handled by GEORGE ZETTLER for the *Flying Tiger Line, Inc.*

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